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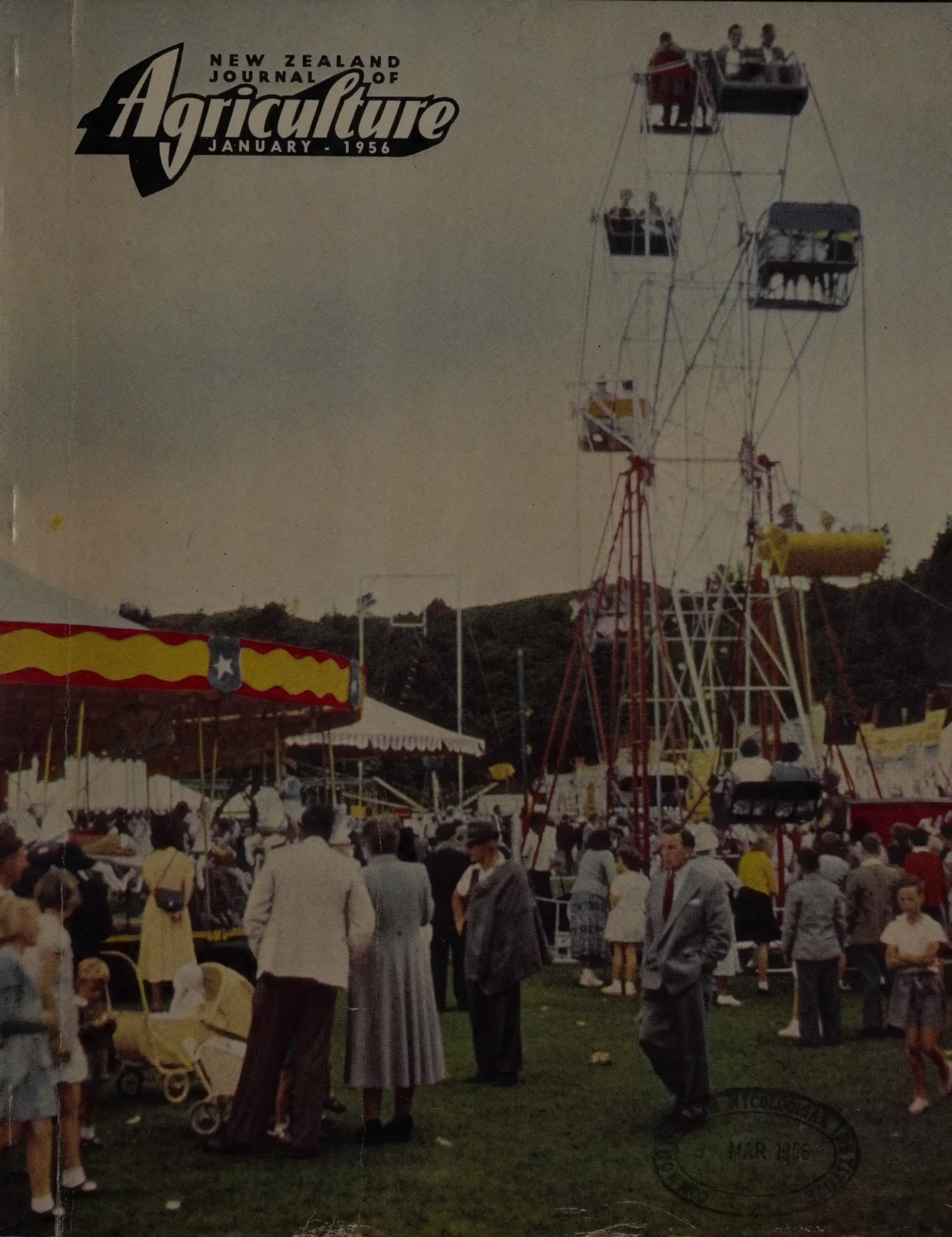

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This Month's Cover

The sideshow section of agricultural and pastoral shows has captured the interest of successive generations of young New Zealanders. Such amusements have become an integral part of the programme at the hundred or so shows which are held throughout the spring, summer, and autumn and the season for which is now approaching its peak. Visitors in portion of the entertainment section at the Wellington and Hutt Valley Agricultural and Pastoral Association's show at Upper Hutt form the subject of this month's cover, which has been reproduced from a colour photograph by D. R. Brenchley.

TABLE OF CONTENTS

The Home Garden	A. G. Kennelly	2
Meteorological Records for November		10
Lift-swing Woolshed Gate	P. C. Marshall	11
Lambing Estimates for 1955 Season		13
Diseases of Turkeys	A. C. Howse	15
Dairy Produce Graded for Export		16
Further Investigations into the Use of Sulphur in North Otago	W. R. Lobb and D. G. Reynolds	17
Whole Milk Production for Auckland City	W. O. McCarthy	26
Melting Honey by Steam	C. R. Paterson	29
Good Resolutions and Pig Production	I. H. Owtram	33
Farm Management Survey of South Otago Downlands	A. H. Mouat	37
Management of Litter in a Household Poultry House		51
Domestic Beekeeping	D. Roberts	53
Show Dates		56
Meeting the Seasonal Feed Requirements of the Dairy Herd	L. R. Wallace	57
Care of Livestock during February		64
Autumn Management of Pastures (Seasonal Notes)		65
Light-weight Concrete as a Building Material	H. W. T. Eggers	67
Use of Plastic Siphons for Contour Irrigation	W. A. Lunn and A. D. Hall	72
Trees on the Farm: Pruning the Woodlot	W. H. Jolliffe	73
Radio Broadcasts		74
Flushing Ewes in North Auckland	C. E. Ballinger	75
"The State of Food and Agriculture", 1955		79
Use of Antibiotics on Sheep Farms	D. W. Caldwell	81
Recent Research Work: Molybdenum		84
Ways of Using Plums	Evelyn E. Moore	85
New Fabrics	Daphne Eilers	89
The Flower Garden	K. H. Marcussen	95
Salad Suggestions for Summer	Daphne Eilers	104

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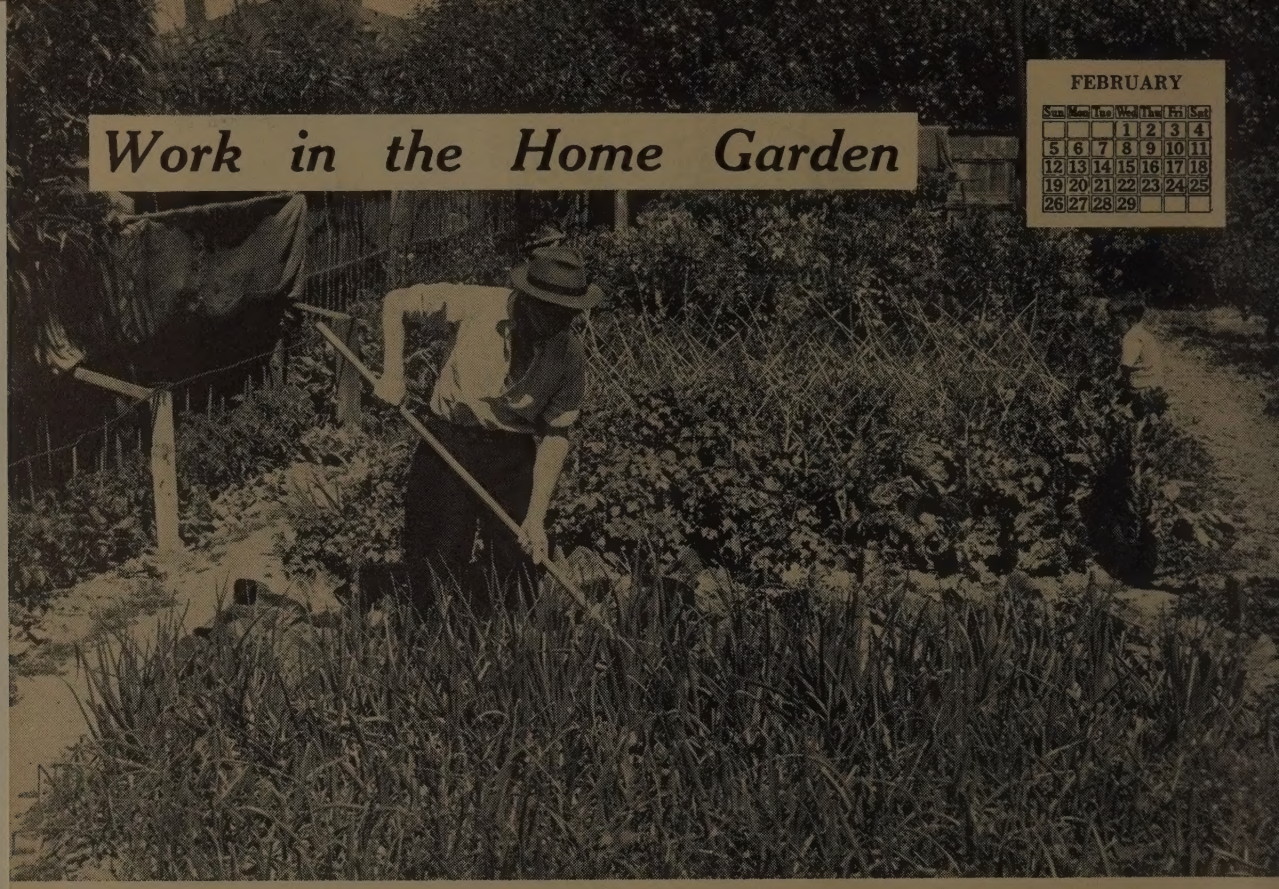
Work in the Home Garden



FEBRUARY is a season of plenty in most home gardens and the pleasures of harvesting reward the successful home gardener. There is usually less urgent work in February than in the months immediately preceding it, but tidying, weeding, and some sowing, planting, and watering have to be done in most gardens. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses work in the home garden in February.

▲ Weeds are usually readily controlled in February by regular hoeing. Green and Hahn photograph.

AS harvesting progresses land becoming vacant and not required for vegetables should be forked over and sown with a cover or green manure crop. Green manuring is not strictly a substitute for animal manure, as except where legumes are sown, it does not add materially to the stores of plant food in the soil. It consists of growing a crop to prevent erosion and leaching of plant food and to increase the organic matter in the soil. The crop grown should be vigorous and of rapid growth, but even a crop of weeds, provided they are not allowed to flower and are not of a twitchy habit, may often be put to good use. Chickweed, fat-hen, spurrey, and redshank can be used, but couch or other twitches, docks, sorrel, and yarrow are unsuitable, as any increase in humus would be offset by increased weed population.

Leguminous crops such as peas, vetches, and lupins are excellent, as legumes have the power of fixing the free nitrogen of the atmosphere in the nodules on their roots. Dug into the soil, the roots, stems, and leaves contribute a valuable supply of combined nitrogen and organic matter. The combined nitrogen is slowly liberated from its compounds by bacterial action and ultimately as nitrate is taken up by the plants. Apart from nitrogen the large quantity of organic matter supplied by digging in a heavy green crop greatly improves the physical properties of the soil.

The non-leguminous crops grown for green manuring have not the power possessed by leguminous crops of increasing the amount of nitrogen in soils, but their growth prevents losses of nitrates and other important nutrients, which they take up and which might otherwise be lost through leaching. Non-legumes suitable for green crops include mustard, barley, oats, ryecorn, and rape.

It is as well to remember that green manure crops draw heavily on the soil water content, and when a vegetable crop is to be sown or planted in late summer or early autumn immediately after a green crop the soil moisture may have been reduced excessively by the green crop. However, this effect is unlikely to occur with green crops sown in February.

Vegetable matter to be dug in, if abundant, should not be allowed to become excessively woody. Usually it should be dug in in the flowering stage. The conversion of plant tissues and other organic matter to a form which may be assimilated by the plant is carried out by bacteria and fungi, of which there are many species in the soil. Specialised groups each perform a definite function. Most are saprophytic, that is, they live on dead organic matter such as animal or plant parts or residues which may be dug into the soil. Provided there is

[*Sparrow*

Seed of quick-maturing crops such as radishes and turnips can still be sown in most districts early in February, but crops such as carrots and lettuce if sown in February are unlikely to reach a good, usable size before winter, except in favourable situations when soil conditions are good.

enough moisture, they multiply enormously in the presence of food, but when the food supply is depleted most of them disappear, for the microbial and fungal population of the soil fluctuates considerably.

Bacteria and also fungi break down nitrogenous substances to ammonia, on which plants feed; specialised bacteria work on the excess ammonia, and the nitrate which is then available is usually considered to be the most easily assimilated form of nitrogen. Thus fungi and a series of different bacteria work in a linked progression to produce food in an assimilable form for the plant from the most diverse and often unexpected material.

The importance of continually adding organic matter to the soil is realised by all successful gardeners. Apart from their high nitrogen content, some leguminous green crops have other values. The state of greenness or succulence of a material is very important and when straw or other material deficient in nitrogen is added to the soil it is advisable to add sulphate of ammonia (or a similar fertiliser) at at least 6lb. per cwt. of strawy matter to give a satisfactory carbon to nitrogen ratio. Some lime is also needed to reduce acidity. This speeds rotting so that the temporary nitrogen starvation effect is avoided and the organic material is converted more speedily to plant food or humus which is homogeneous with the soil.

Owing to the need for continuous and usually intensive cropping, most home garden soils tend to lose organic matter more quickly than it can normally be replaced and it is therefore most important to dig in any available organic material. All rubbish which is free from insect pests and diseases should be returned to the soil either via the compost heap or dug directly in. The urban home gardener is unlikely ever to be in the happy position of having available more organic material than his garden requires.

Asparagus

Top growth of asparagus is now well developed and in exposed gardens support may be necessary. Stout string tied to stakes driven into the ground at 5ft. to 6ft. intervals is usually satisfactory. Weed control is not difficult if the weather is dry, as most weeds are smothered by strong fern growth. Where weeds are troublesome they should be removed by hand to prevent their seeding. Beds should not be neglected because cutting is finished. If dry, they should be watered and, though February application is rather late, fertiliser can be supplied with advantage if none was given after cutting ceased.

Considerable research into the manuring of asparagus has been done and generally research workers agree that a complete fertiliser (one containing nitrogen, phosphoric acid, and potash), should be supplied, but there is some difference of opinion as to the best time to apply it. Advocates of early spring application usually favour in addition a dressing of quick-acting fertiliser such as nitrate of soda or sulphate of ammonia at 1oz. to 2oz. per square yard after cutting ceases. On most beds the time of application of a complete fertiliser seems to make little difference to production. If applied just before cutting, the fertiliser can have little effect on the current crop; the important point is that a balanced fertiliser should be available to the plant to enable it to build up food reserves from which good spears can be produced.

Carrots

A late sowing of one of the quicker-maturing varieties of carrots can be made in warmer districts in February. If success is to be obtained in southern and most central districts of New Zealand, the situation and autumn weather must be favourable and the seed sown without delay in soil that is in good condition and worked to a fine tilth.

Carrots are not difficult to grow if the soil is fertile, cultivated to a fine tilth, moist, and well drained, and the plants kept free from insect pests. Light, sandy loams produce the smoothest and straightest carrots, but all good loams apart from the heavier

[*Green and Hahn*

Well-grown celery plants can still be set out early in February in most districts, but a favourable situation should be chosen. The soil should be rich and adequate moisture should be available. Some very effective fungicidal sprays for the control of celery leaf spot disease are now marketed.

clay loams can be improved to produce satisfactory crops.

Difficulty in growing carrots is commonest in the smaller garden, where cropping is usually continuous and good crop rotation with adequate green cropping is difficult, and in soils that have been worked for many years without having had much organic matter such as compost, heavy green crops, or farmyard manure applied to them. Soils that were heavily dressed with organic manure for the previous crop usually produce good carrots. Heavy dressings of organic manure just before sowing are not advised, though results may be satisfactory if the manure is well rotted and mixed throughout the root area. Carrots coming into contact with lumpy masses of fresh or only partly rotted manure may be forked or otherwise distorted.

Results are likely to be better on most soils if mineral fertiliser is used to supplement the organic manure in the soil. A complete fertiliser (or more correctly what is commonly known as a complete fertiliser, that is, one made up to contain major amounts of the elements nitrogen, phosphorus, and potassium), is likely to give the best results over the greatest range of soils, but good responses have been obtained on many fertile New Zealand soils from superphosphate alone.

Seed should be sown ¼in. deep in rows 12in. to 15in. apart at about 15 to 20 seeds to each running foot of row. On soils that form a crust after rain the crust should be broken to facilitate emergence of the tiny shoots.

Aphides can be controlled by spraying on a warm, still day with nicotine sulphate at 1½ teaspoons (approximately) to 1 gallon of water plus a little soap or lime to activate the nicotine. Alternatively HETP can be used at the same strength without soap or lime.

Celery

In districts where good growing temperatures can be expected for the next 2 months celery can still be set out. Where autumn or early winter weather is not too boisterous or frosts too severe a variety such as Golden Self-blanching can be planted. Elsewhere one of the hardier non-self-blanching varieties such as Solid White is preferable.

Celery plants should receive plenty of water; liquid manure is especially valuable where plant food and water tend to be deficient. Plants must be kept growing vigorously. Where leaf spot disease is troublesome, sprays of bordeaux mixture or other suitable, Government-certified fungicide should be applied regularly.

Chinese Cabbage

Chinese cabbage is somewhat like cos or romaine lettuce, but the size of its oval, elongated head is usually nearer that of Swiss chard. It is sometimes called lettuce-cabbage, as the texture of its leaves is more like that of lettuce than that of an ordinary cabbage. Chinese cabbage is tender and quick growing, the commoner varieties maturing in good conditions in about 70 to 90 days. It should be treated like lettuce, but as it grows much bigger, it needs wider spacing. The plant is also known as celery-cabbage because of its flavour and because some of the forms resemble celery somewhat in appearance.

Where growing conditions are favourable in autumn, plants can be matured before winter from a February sowing. Alternatively plants can be sown in spring, as Chinese cabbage usually does well in the cool conditions then prevailing. Seed can be sown in good soil in a sheltered situation or in boxes under glass 3 to 4 weeks before plants are required for setting out. Spring or autumn sowing is best in most districts, because if the weather is hot and dry, growth is slow and consequently the plants often fail to head properly, developing seed stalks instead.

Chinese cabbage stores quite well after cutting and may be eaten either cooked or raw. The inside blanched leaves and heavy but tender midribs have a delicate celery-lettuce flavour.

Seed is best sown ½in. deep in rows 18in. apart in a moist, well-drained soil that is very rich in humus. When the seedlings are 3in. to 4in. high they should be thinned or transplanted 12in. apart in the rows.

Varieties include Wong Bok (Pao Ting), which is a short, quick-growing variety 9in. to 11in. high and up to 6in. in diameter. Pe Tsai is a taller and thinner variety than Wong Bok with looser leaves. It stands dry conditions slightly better, but its flavour is not usually considered as good as that of the others. Chihli is a tall early variety 15in. to 20in. high with a base diameter of about 3½in.

Herbs

Most keen gardeners find herbs among the most interesting and rewarding plants, less perhaps from the point of view of their botany or morphology than from more general factors, such as the history of their

usages and associations, their scents and flavours, and their attraction for bees.

Though the times of maturity of herbs vary somewhat according to district and situation, there are a few that can be harvested in most gardens now. One of these is peppermint, which for distilling should be cut when in flower. Spearmint can also be gathered, though it is more usual to gather it as required during summer. It should be cut on a dry day when the plants are in flower and should be tied in small bunches and hung in a dry shed until the leaves have become brittle. Later they can be rubbed to a fine powder and stored in airtight bottles. Sage, too, can be stored, though if desired, it can be gathered as it develops. Small shoots should be tied together and hung to dry and when ready the leaves can be stripped, rubbed fine, and stored in airtight bottles.

The leaves of clary (*Salvia sclarea*), a less common sage also known as sweet sage, can be gathered, dried, and stored similarly.

Coriander is a herb not seen much in home gardens now. The ripe seed should be dried in the sun and stored in stoppered bottles. The leaves can be used similarly to those of ordinary sage. The seeds are aromatic and useful for flavouring curries and stews. They can also be used in a number of other ways, including the flavouring of drinks.

Seed of such subjects as chervil (*Anthriscus cerefolium*) and purslane (*Portulaca oleracea*) can be sown. Both the common and curled chervil are used like parsley or for flavouring soups and stews. Soil for chervil should be light and fairly rich, though the plants grow well in either full sunlight or shade. Seed germinates readily, but unless the centre bud is nipped out, the plant goes to seed quickly if transplanted. Seed should be sown every month for best results, but in the colder districts it may be advisable in winter to sow it in boxes under glass.

Purslane deserves to be grown more often than it is, as it is easy to grow and the young leaves and shoots can be eaten cooked as a vegetable or raw as a salad. It is rather tender and requires a warm situation in full sunshine. A light soil is preferred. Clear and correct labelling is an important point which should not be overlooked when dried herbs are stored in bottles.

Parsley is usually in constant demand and to ensure adequate supplies seed should be sown twice a year in most gardens, in spring and in autumn. The plant is a biennial and unless conditions are especially favourable, germination is usually slow; if two sowings are not made, there may be a break in supply. Parsley responds well to rich, well-drained soils and fertiliser is just as necessary as for other crops.

[*Green and Hahn*

Kale seedlings, like those of most other crops grown for winter greens, should be established now so that they reach maturity in late autumn or early winter. Good strains of kale provide fine, tender leaves which may be picked successionally over a long period.

Seed can be sown in rows or broadcast on a small prepared plot, but for best results the plants should be spaced about 8in. to 12in. apart when at the seedling stage. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Seed may be slow to germinate, but sometimes germinates quite promptly if it is first soaked or is sown in very moist soil.

There are several types of parsley, but they are rarely listed by New Zealand seedsmen. They may be grouped as follows:—

(a) **Plain leafed** or Italian: This is very hardy, but rarely grown in New Zealand.

(b) **Fern leafed:** The leaves of this type are deeply cut, but the segments are not twisted.

(c) **Curled:** This is the most popular type of parsley grown in New Zealand and most seedsmen's catalogues list varieties of it. The leaves are deeply divided into segments which are twisted or curled over.

Within these groups there are dwarf, compact, and tall varieties. In addition the variety known as Hamburg with the coarser-leafed types is included. It has an edible root about 7in. to 8in. long and about 3in. thick somewhat resembling a small parsnip in shape and colour. The roots are very tender when grown in a rich soil well supplied with moisture. The different varieties of parsley vary in colour from light to dark green. Tall varieties have about 7in. to 8in. of stem and are suitable for bunching. The dwarf, compact varieties, which may be only about 5in. high, are useful in the home garden.

If two sowings are made each year, there should be no need to dry or store parsley. Storing is, however, quite a simple matter. The most desirable dried parsley is obtained by constantly picking a few of the best young leaves as they develop in summer and autumn; spring-dried parsley rarely keeps its colour. The leaves can be laid out in single layers and dried in heated rooms, though most housewives will find it more convenient and the final product better if

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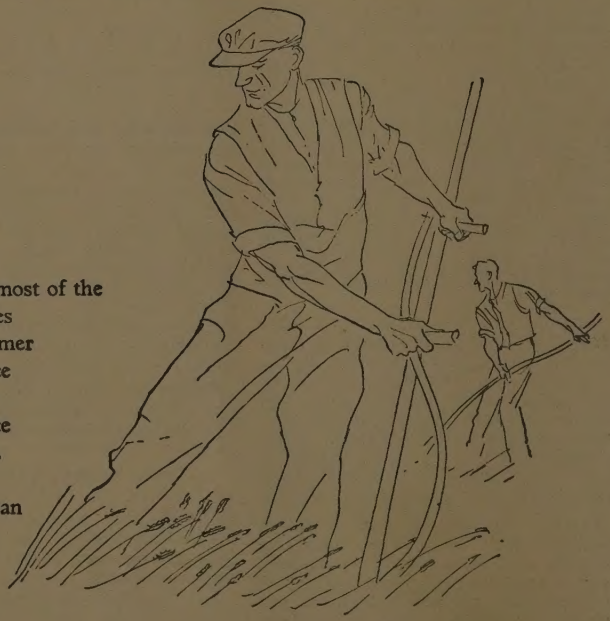

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the leaves are dried at a temperature of about 90 degrees F. in a fairly hot oven with the door open. Quick drying is imperative if the essential oils that give parsley its characteristic scent are to be retained and too much of its colour is not to be lost. When dry it should be rubbed or pulverised and coarse pieces of stalk should be removed. The leaves can then be put in bags and should be stored in a dry place. If allowed to re-absorb moisture, they tend to become rubbery.

Parsley is sometimes gritty with soil from rain splashes, but it should not be cleaned with boiling water. If it cannot be cleaned with a thorough shaking, it should be washed under a cold tap.

Because parsley is a biennial, it usually begins to send up seed stalks early in its second year. Little is to be gained, however, by picking them off, as the plant's energy becomes more and more concentrated on their production.

Greenfly is often troublesome on parsley, but is easily controlled by spraying with nicotine sulphate 1 : 800 (1½ teaspoons of nicotine sulphate to 1 gallon of water plus a little soap dissolved first in water), or HETP can be used at the same strength.

It is very important to keep the herb garden free from perennial weeds, particularly convolvulus, oxalis, and couch grass, which should be removed before they are properly established.

Onion

Most onion crops are mature by February. Harvesting can begin when the bulbs are firm with thin, dead, wiry roots and most of the tops are withered and tend to fall over naturally.

Though the commercial grower often wheel hoes his onions from the bed, in the home garden onions can be pulled by hand; if they still have a fairly firm hold when it is necessary to start harvesting, the roots can be cut with a sharp hoe. After lifting, the onions should be laid on their sides to dry. It is usually advisable to turn them several times so that they ripen quickly. Bulbs with thick necks that refuse to bend should be selected for early use. If the weather alternates between wet and dry, onions should be lifted off the ground and spread to dry elsewhere.

Though manurial treatment and growing conditions are very important in producing good onions, their keeping quality will depend largely on the care taken in harvesting and drying. A spell of fine weather is essential unless suitable facilities such as a drying room are available.

Peas

Early or quick-maturing peas can still be sown in favourably situated northern districts, preferably early in the month, though in most southern districts even early February sowing is rather late if peas are to mature before winter. Sowing should be confined to sheltered situations lying well to the sun and where the soil is well drained and in good condition.

In good soils peas do not need heavy fertiliser dressings and commercially very moderate dressings of superphosphate alone have given good results on a wide range of soils. Garden peas are fairly tolerant of soil acidity and usually grow well in fairly acid soils, but moderate applications of lime, about 2oz. to 4oz. per square yard, are advisable on the more acid soils.

Injury often results where fertiliser is applied in the drills with the seed. It is best applied to the soil 2in. to 3in. on either side of the seed row or at least 1in. under the seed. Fertiliser can be applied in a drill taken out with a hoe and partly filled in before the seed is sown. Peas require well-drained, fertile soil and in any but the most fertile soils they repay soil improvement measures. Deep digging of heavy soils and incorporation throughout the root area of moderate quantities of well-rotted organic matter are advised. Surface or near-surface applications are not only liable to cause seed injury, but may encourage surface rooting which is to be avoided where conditions are likely to become dry.

A supply of nitrogen in the soil helps young plants to become established, but most soils that have been kept in good condition by regular dressings of well-rotted organic matter should be adequately supplied.

Seed for dwarf varieties should be sown 1in. to 2in. deep at about 10 to 15 seeds per running foot in rows at least 18in. apart. If the drills are taken out a little deeper, when part of the covering soil is put back the hollow left will serve to mark the row and facilitate watering. Later the peas can be earthed up to some extent to keep the roots cooler and to hold the plants more firmly in windy conditions. Early or quick-maturing peas include such varieties as Little Marvel, Utility, Early Crop, and William Massey.

Salad Crops

Salads are most in demand in hot weather, and if conditions are not too dry, there should be some salad vegetables available in most home gardens in February. Tomatoes and cucumbers are regarded as main crop vegetables and are ready for harvesting in most gardens, but successional sowings are necessary for radishes, spring onions, lettuces, mustard, and cress.

Chives are an excellent substitute for spring onions and should be grown in the garden of every household where the flavour of spring onions is appreciated. The leaves or "grass" are used as a mild substitute for onions in flavouring salads, soups, and omelets. Chives are easy to grow and do not require any particular soil, though they do especially well in a good, well-cultivated soil that suits onions. If the foliage is cut frequently, new tender "grass" develops continuously. Plants should be lifted, divided, and replanted in fresh ground in spring or autumn every 3 or 4 years.

[*Green and Hahn*

Dwarf varieties of sweet corn are especially useful in small or exposed gardens.

Radishes are not easy to grow successfully in hot weather unless the soil is very fertile and there is adequate moisture. The roots should not be allowed to dry out, and in February shelter from the sun is often advisable. It can be given by sowing radishes in the shade of a taller crop such as celery or sweet corn. The top 6in. of soil for radishes should be finely cultivated and very rich in well-rotted organic matter. Seed should be sown ¼in. deep in rows that need be only about 4in. to 6in. apart.

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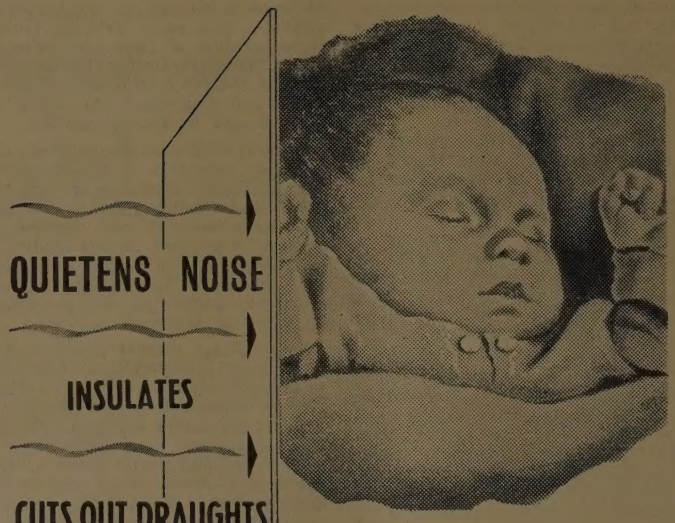

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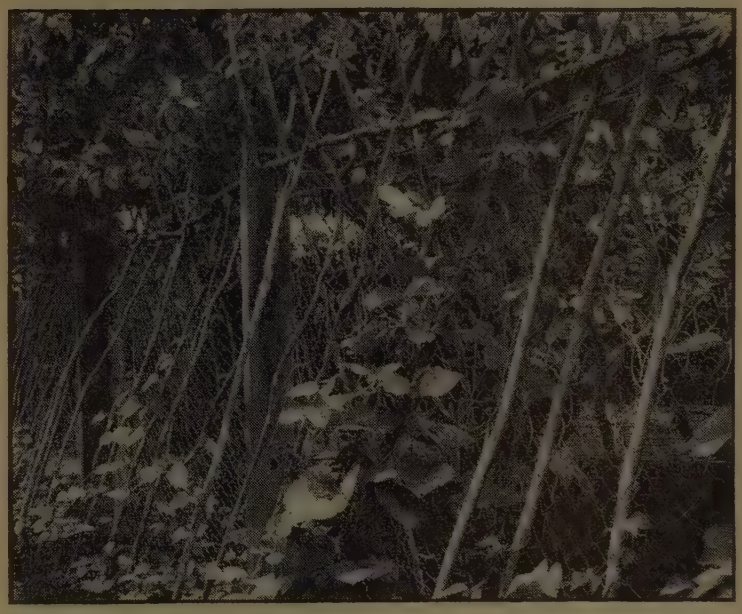


[*Sparrow*

Runner beans can be grown without support by nipping out the growing points when plants are about 18in. high, but for best results plants should be allowed to climb a fence or suitable structure of poles and wire netting such as that shown.

The soil should be gently firmed before sowing or the roots will not bulb properly.

Good lettuce is an essential component of most salads, but, like radish, it is not easy to grow well unless conditions are favourable. It requires a constant and fairly high amount of soil moisture from seeding to harvest, as wide fluctuations are liable to cause plants to run to seed prematurely or their quality to be poor; plants may not heart well and are then usually tough and bitter. The soil should never be very wet for long after rain or irrigation; it should drain quickly so that it is soon freely workable. On the other hand the moisture content of the soil should never become so low that more than the surface is dry. Such exacting conditions make lettuce production in hot, dry districts very difficult and the more adaptable varieties should be chosen where possible.

Varieties such as Imperial 847 and New York No. 12 will tolerate a wide range of conditions and can be grown for a long period in most districts. Strains such as Webbs Wonderful, Neapolitan, and Success, however, generally give good results. For those who are content with an open rather than a hearting type of lettuce the variety Bronze Beauty matures very quickly and has an excellent, rather nutty flavour. It is a vigorous grower and withstands hot conditions. The colour of the leaves is a ruddy bronze overlying a soft green.

Seed of lettuce should be sown thinly ¼in. deep in rows 12in. apart and the plants should later be thinned to 10in. to 12in. apart in the rows.

Silver Beet and Spinach Beet

There are some very fine strains of silver beet (Swiss chard or sea kale beet) on the market and the large but tender and succulent midribs of some strains, if properly prepared for the table, are not inferior to sea kale in flavour. In New Zealand the plant is grown mainly for its green leaves, which are a good source of vitamins.

Under favourable conditions silver beet yields very heavily. It stands well, but is not as long standing as spinach beet, a closely allied plant, the leaves of which are used after the manner of spinach. Spinach beet can, however, be harvested for very much longer than spinach and once established it is more tolerant of adverse conditions such as dryness and extreme temperature changes. It will, for instance, produce a continuous supply of leaves in hot, summer weather, when true spinach is difficult to grow.

Both silver beet and spinach beet are very useful, relatively quick-maturing vegetables which grow well even in the cool conditions of early spring or autumn. To maintain a succession seed should be sown outdoors in early spring as soon as the ground is in condition, though if it is sown in boxes under glass and the plants set out when large enough, earlier crops can usually be obtained. Later sowings are usually made where the crops are to stand. If soil conditions are sufficiently moist, thinnings can be transplanted.

The soil should be well drained, well cultivated, and enriched with well-rotted organic material such as stable or farmyard manure or compost or with blood and bone. Where mineral fertilisers are required (and on most soils results are better if organic manure is supplemented with mineral fertiliser) a complete fertiliser should be applied at the rate of 2oz. to 4oz. per square yard. It is important that the soil should contain sufficient lime.

In most districts crops for winter or early spring can be obtained from a February sowing, though (particularly in southern districts) the situation must be favourable and the soil in good condition so that the seed germinates promptly and the plants grow strongly during the remainder of autumn. Later sowings are usually satisfactory in very mild districts. Seed should be sown ½in. to 1in. deep in rows 15in. apart and the young plants later thinned or planted out to about 8in. apart in the rows.

Varieties of silver beet or Swiss chard include the following:—

Fordhook Giant, a tall, sturdy variety with broad, heavily crumpled (or savoyed), dark green leaves and broad, thick, white stems and midribs.

Lucullus, an erect variety with stems broad, rounded, thick, pale green, and finely ribbed. The stem is bare for about 12in. of its 3ft. length. The leaves are fleshy and crumpled and yellowish to light green.

Large Ribbed Dark Green has smooth, slightly crumpled, dark glossy green leaves. The stems and midribs are clean, white, broad, and comparatively thick. This variety has a very fine distinct flavour.

Rhubarb Chard has bright crimson-red stems and midribs. The leaves are crumpled and dark green and have red veins. It is a Brazilian or Chilean beet.

Rainbow is a reputed cross between an improved Swiss chard and beet. It has large crumpled leaves and multi-coloured stems.

Spinach Beet, Perpetual Spinach, or Common Green Spinach Beet has smooth green leaves with slender midribs of lighter green. Practically all varieties of spinach beet are similar in habit. They do not develop a main stem until they are ready to seed, but instead develop numerous leaves,

which may be picked over a long period.

Spring Cabbage

Except in a few northern districts where the winters are mild, the home gardener regards spring cabbage as cabbage of the smooth-leafed, pointed, or, as it is sometimes described, the oxheart variety which is usually sown in autumn and overwintered in the open for cutting in spring. In mild districts where the smooth-leafed, round varieties can be overwintered successfully these cabbages may also be termed "spring" cabbage.

Because the pointed or oxheart type of cabbage is hardy, relatively quick maturing, succeeds in a wide range of conditions, and is especially suited to autumn sowing in most parts of New Zealand, it is probably more popular in home gardens than any other cabbage except the savoy. Good varieties mature quickly under favourable cultural and climatic conditions, for though cabbage is primarily a cool-weather vegetable, growth is greatly accelerated by moderately high temperatures if there is adequate moisture and the soil is rich in plant foods.

The average period of maturity is about 16 to 18 weeks, but the term average covers a wide variation in maturity time and if temperatures are low and cultural conditions unfavourable, the plants may take up to about 7 months from seeding to maturity. Conversely where conditions suit them they may mature in considerably less than 16 weeks. It is this ability to succeed under a wide range of climatic and cultural conditions (though it is not possessed equally by all varieties) that makes the pointed type of cabbage so popular.

The first autumn sowing of cabbages for overwintering in the open should be made in February, except in the milder northern districts, where a first sowing can if desired be made in March. Plants should be ready for setting out about 6 weeks after sowing.

Home gardeners often set plants out when they are very small. This gives satisfactory results if the garden is sheltered or conditions are very favourable. Plants should be sturdy and well developed and should be lifted with a fibrous tuft of soil and roots. Blind plants (those with no growing points) or very weak plants should be discarded. Under some conditions plants with coarse, thick taproots may develop better if about 1in. is cut from the root end.

Where considerable periods of low winter temperatures (40 degrees F. and down to freezing point) are experienced it is important that sowing should be timed to produce plants that are neither too large nor too small and for this reason February sowing is preferred in most districts. Where the autumn is very mild, particularly if it is moist, the resultant soft growth and large plants are liable to damage if winter conditions are severe, and premature seed development may then occur in spring.

Plants for setting out in late autumn in districts where winter conditions are severe should be sturdy and well developed with stems about 3/16in. thick but not much larger (about the size of a lead pencil). Plants noticeably smaller may be killed or severely checked if subjected to prolonged low temperatures and severe winter weather.

The seed-bed should be dug over and cultivated to a fine tilth. Soils lacking humus should be dressed with such material as compost or well-rotted farmyard or stable manure. However, manure should be thoroughly incorporated, as germinating seed may rot if it comes in contact with a considerable quantity. Cabbage seed should be sown ¼in. deep in rows about 12in. apart. It can be broadcast, but the plants are then more difficult to weed and usually a little more difficult to lift.

Varieties such as Flower of Spring and Jersey Wakefield are among the quickest maturing; Enfield Market is classed as second early and normally matures about a fortnight later. Flower of Spring is the most suitable for a wide range of conditions and is very popular, particularly in southern districts.

Tomatoes

Spraying, pruning, and tying of tomatoes should be continued as required. Where growth is very heavy and the fruit is setting and developing well yet ripening too slowly, partly because it is shaded by foliage, cutting back of the covering foliage up to the nearly mature fruit with a sharp, clean knife is sometimes desirable. Spraying is then easier and the likelihood of infection from some diseases is less because of improved air circulation and reduced humidity.

In districts where potato blight, looper caterpillars, and stem-borer caterpillars are troublesome plants should be sprayed with bordeaux or a suitable Government-certified substitute against potato blight and with DDT to control caterpillars. Because of possible danger from residue of DDT spray on ripe fruit, it should not be used later than a fortnight before harvesting. Derris can be used in place of it.

Winter Greens

Leeks can still be set out in most districts, but well-grown plants should be chosen. Established leek plants, together with other late autumn or winter greens such as savoy cabbage, cauliflower, broccoli, brussels sprouts, and kale, should not be permitted to become dry, as adequate moisture is essential for quality and growth. If the soil is poor or lacking in humus, all these subjects should be watered with liquid manure. Winter greens can still be set out in districts having a sufficiently mild autumn, but good plants should be chosen and set out in favourable situations where the soil has been suitably cultivated and enriched.

Meteorological Records for November

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	61.2	+ 2.1	77.3	38.7	4.59	16	+ 0.75	1.26	28	188.5
Auckland	160	61.2	+ 0.8	75.4	47.5	3.82	13	+ 0.52	1.00	18, 19	195.2
Tauranga	10	59.2	+ 0.4	74.3	42.0	1.86	13	— 1.58	0.40	18	219.4
Ruakura	131	57.7	+ 0.3	72.1	35.3	3.03	14	— 0.65	0.72	10	190.8
Rotorua	975	57.1	+ 0.3	73.6	36.7	1.89	14	— 2.09	0.82	18	186.7
Gisborne	12	60.6	+ 1.6	78.0	38.2	1.11	12	— 1.48	0.41	22	222.6
New Plymouth ..	160	56.8	+ 0.0	67.1	42.7	3.42	13	— 1.29	0.94	18	186.9
Kaitoi	2125	52.2	+ 0.3	69.3	31.5	3.38	16	— 0.48	1.15	3	
Napier	5	61.4	+ 1.8	84.1	42.9	0.61	10	— 1.48	0.26	22	233.5
Wanganui	72	58.8	+ 0.6	74.0	43.8	1.58	12	— 1.04	0.39	3	210.0
Palmerston North .	110	57.4	+ 0.5	73.4	40.0	2.91	12	+ 0.05	0.62	3	165.4
Waingawa	340	57.0	+ 0.9	75.5	35.0	1.03	11	— 1.67	0.40	22	244.6
Wellington	415	57.2	+ 1.4	69.8	41.5	2.57	12	— 0.80	0.97	3	236.4
Nelson airfield ..	5	56.2	+ 0.7	71.0	39.0	2.57	11	— 0.16	0.93	28	220.1
Blenheim	12	58.1	+ 1.2	76.0	36.9	1.84	10	+ 0.13	0.76	3	282.6
Hokitika	15	52.9	— 0.9	63.8	39.8	10.13	17	+ 0.20	2.84	25	197.2
Hanmer	1270	54.1	+ 0.3	74.0	33.0	2.38	12	— 1.10	0.92	28	238.4
Christchurch ..	22	57.8	+ 1.5	78.0	37.0	1.40	8	— 0.42	0.78	28	250.0
Ashburton	323	57.8	+ 2.1	81.8	35.4	3.17	8	+ 0.72	0.79	21	236.1
Timaru	56	57.2	+ 1.7	77.8	38.8	2.03	10	+ 0.08	0.54	28	231.3
Alexandra	520	56.8	+ 0.4	79.9	35.5	1.08	9	+ 0.00	0.51	1	225.3
Taieri	80	54.2	+ 0.8	76.9	34.2	3.10	14	+ 0.82	0.86	1	195.3
Invercargill airfield	0	52.0	+ 0.2	75.4	35.3	3.99	17	+ 0.35	0.87	23	190.6
Chatham Islands ..	140	53.0	+ 1.0	65.9	39.2	3.44	10	+ 1.21	1.44	3	

Lift-swing Woolshed Gate

INTERIOR woolshed gates have not changed greatly for a number of years, though new designs are being tried continually; some are ungainly and unpractical, others show careful thought and have been proved to be practical. The counterweight lift type has many advantages, the main one being economy of space and movement. Ordinary hinged swing gates also have their advantages. The lift-swing gate described in this article by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Napier, has combined many interesting points of the different styles for adoption at the rear of catching pens.

THE gate may be lifted, it may be swung, or it may be used as a combination, lift-swing gate; that is, lifted, swung out over the sheeps' backs, lowered behind, and closed in a normal swing gate position. Construction costs are modest and the gate may be adapted to any existing or new woolshed.

Materials for Gate

The materials needed to make the gate are:—

Timber: 1 piece of 4in. x 3in. 9ft. long, block 3in. x 2in., 1 piece of 6in. x 1in., 9in. long.

Bolts: 6 2½in. x ⅜in., 2 8in. x ½in., 2 2½in. x 9/16in.

1 piece 1½in. diameter pipe (1⅝in. outside measurement) 7ft. 6in. long.

1 awning pulley (2in. or 3in.).

4 1½in. x ¼in. mild steel straps each 1ft. long.

2 rollers.

1 lift wire approximately 7ft. long (to be adjusted).

1 gate of desired size.

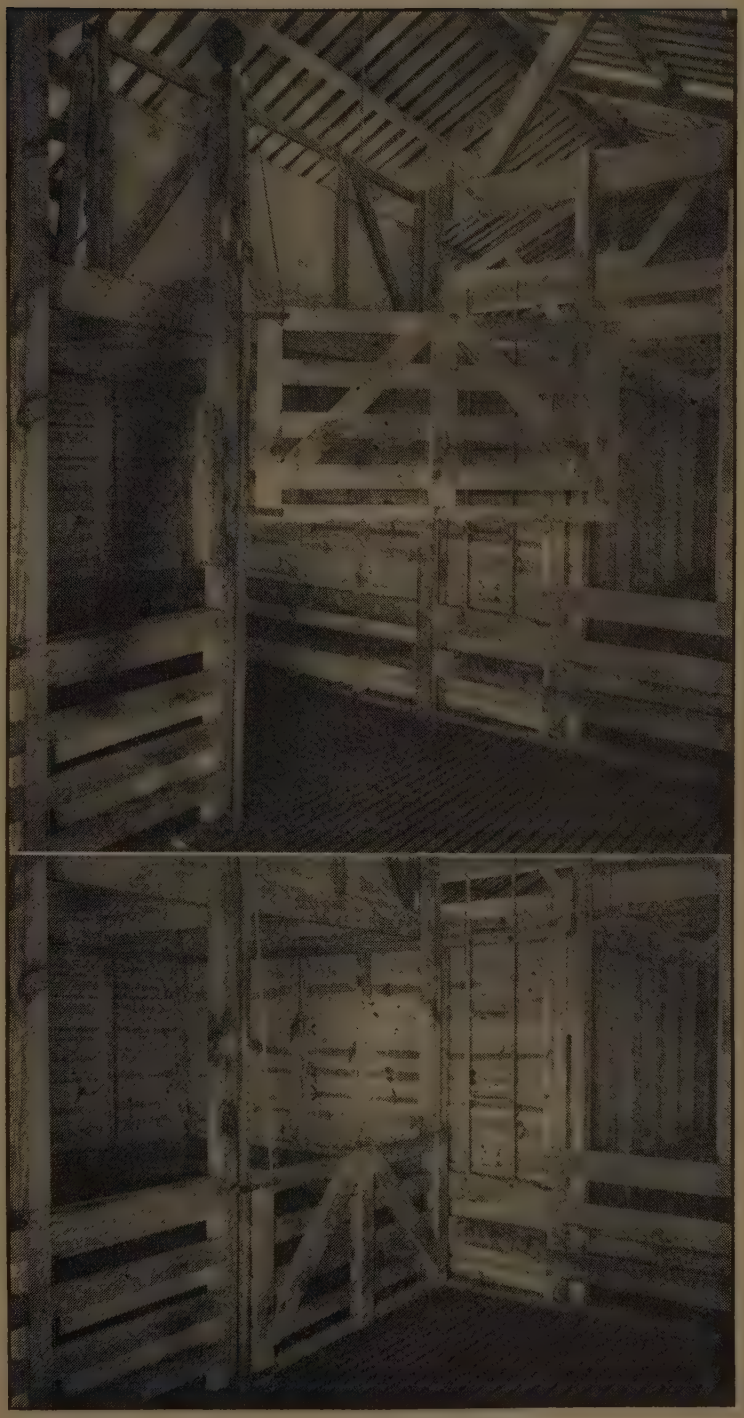
1 piece of ½in. diameter mild steel, looped and threaded, 6½in. long.

1 counterweight.

1 flat washer to fit over 1½in. pipe.

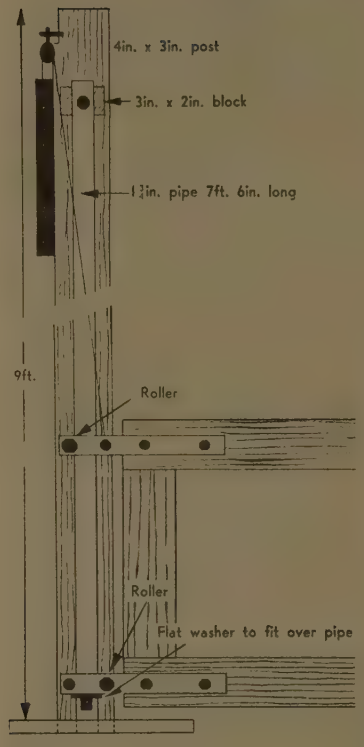
Method of Construction

The 7ft. 6in. length of 1½in. diameter pipe is bolted to the post (the 9ft. length of 4in. x 3in. timber) by the 8in. x ½in. bolts, holes in the pipe to take the bolts being bored on centres 2in. in from either end. The top bolt passes through the 3in. x 2in. wooden block, which has a ¼in. deep groove

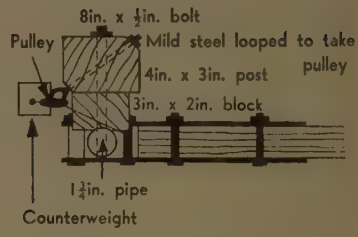


Lift-swing gate made on the principle described, but differing in some details.

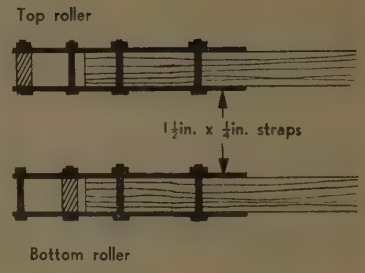
LIFT-SWING WOOLSHED GATE



Side view.



Top view.



Arrangement of straps and top and bottom rollers.

cut in it to hold the pipe rigid. The bottom of the pipe fits into a hole bored in the 9in. length of 6in. x 1in. timber, which is nailed in position beside the post. The gap between the post and the pipe is 1⅜in. The large flat washer is fitted over the pipe above the bottom bolt, where it facilitates the easy swinging of the gate.

Attaching Straps

The steel straps are attached in pairs at top and bottom of the gate, extending 4in. beyond the end of the gate. Holes to take a 9/16in. bolt are bored in the top pair of straps on centres §in. in from the outer ends. A similar hole is bored in the bottom straps §in. in from the gate end. The rollers are then placed between the straps where the holes have been bored and the 9/16in. bolts passed through the straps and rollers and tightened. The 2½in. x §in. bolt on the inside of the pipe through the top straps is used to anchor the lift wire, and the 2½in. x §in. bolt on the outside of the pipe on the bottom straps acts as a backstop.

Pulley Support

A hole is drilled diagonally through the post about 6in. down from the top to take the piece of 6½in. mild steel, on which the pulley hangs. It is desirable to bevel the corner from which the hole is started to facilitate the drilling and to leave a square surface for the nut to fit against when the pulley support is tightened up. The loop in the piece of mild steel should be left open sufficiently to allow the awning pulley to be attached. It is closed up when the pulley is in place.

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Diseases Affecting Maize Crops

MAIZE is the crop in the Gisborne-east coast district which regularly pays greatest dividends. However, the profitable continuation of maize growing is threatened by diseases built up during years of continuous maize cropping, some land having grown maize for at least 15 years in succession.

The main diseases affecting maize are loose smut (*Sorosporium reilianum*), Gibberella stem rot (*Gibberella zeae*), and maize blight (*Helminthosporium turcicum*).

Smut has been recognised for years and has been extending its influence quietly until now quite large areas are infected. It affects seedlings, tassels, and cobs.

Gibberella zeae not only attacks the stems of mature plants, causing straw-break, but also can attack seedlings to an extent which gives the impression of exceedingly poor germination. Seedling attack is particularly encouraged by the incidence of a cold spell when the seed is germinating. Very early sown crops, therefore, are more likely to be affected than later sown ones. The sowing of maize in wet, cold soil also predisposes the crop to seedling attack.

Maize blight reached epidemic proportions for the first time in the 1952-53 season. It attacks foliage and gives an effect of severe scorching of the leaves. It is probably of less importance than the other two diseases, though its spectacular damage in suitable seasons is much more noticeable and it causes heavier damage to crops in an epidemic year. If the disease is to reach epidemic dimensions, however, the season must be moist and warm, particularly between October and February, to allow the spores to attack the crop in an immature stage.

Control

There is no chemical method of preventing these diseases, though the application to seed maize of organic mercurial dusts reduces the incidence of smut appreciably, particularly in the seedling stage. All Certified seed maize is so treated. The chief measures for reduction of infection are therefore concerned with crop rotation and hygiene.

All stubble should be burnt on the ground as soon as the picker leaves the paddock. A flamethrower is excellent for starting the fire. Stock should not be used to clean up the paddock, as spores carried in their hoofs can infect clean land. Ploughing as deeply as possible should be done as soon as the burn is completed.

A 4-year spell should take place between maize crops, and as far as possible wheat, oats, barley, and rye should be excluded from the interim crops. If it is essential that any of these be grown, they should be taken immediately after the maize to give as long a spell as possible before the next maize crop is grown. Safe crops for use in the interval are peas and beans, roots, kale and chou moellier, and short-rotation pastures.

To reduce the carrying of infection to clean areas diseased paddocks should be harvested last of all and pickers, shellers, and lorries should be washed down well at the end of the season. All cob waste and chaff should be burnt promptly after shelling.

—H. de O. CHAMBERLAIN,
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Department of Agriculture,
Gisborne

Lambing Estimates for 1955 Season

Though the number of breeding ewes in the Dominion in 1955 was 1,335,828 higher than in 1954, the estimated number of lambs is only 1,035,675 higher than in 1954 and the estimated lambing percentage of 94.80 is 0.93 lower than the 1954 figure of 95.73. As was the case in the 1954 season, the decrease has taken place in the North Island, where breeding ewes have increased by 574,249 but the estimated number of lambs has increased by only 297,581, resulting in a decrease of 2.25 in the estimated lambing percentage. In the South Island breeding ewes have increased by 761,579 and the estimated number of lambs has increased by 838,094, giving an estimated lambing percentage of 103.46, an increase of 0.45 on the previous year's figure. The lowered lambing percentage in the North Island would appear to be due to the threat of a serious outbreak of facial eczema at tupping time. Totals for counties, districts, and the Dominion are set out in the following tables, which have been contributed by the Animal Industry Division of the Department of Agriculture.

NORTH AUCKLAND LAND DISTRICT

County	Breeding ewes (as at 1955)	Estimated percentage of lambs	Estimated number of lambs
Mangonui	38,253	67.7	25,897
Whangaroa	15,790	78.5	12,395
Hokianga	46,297	78.0	36,112
Bay of Islands	81,524	80.8	65,871
Whangarei	104,348	81.8	85,357
Hobson	108,640	85.1	92,453
Otamatea	103,503	80.9	83,734
Rodney	126,021	75.3	94,894
Waitemata	105,537	82.7	87,279
Great Barrier Island	4,640	72.9	3,383
Manukau	85,495	82.3	70,362
Franklin	172,741	90.4	156,158
Totals	992,789	81.98	813,895

SOUTH AUCKLAND LAND DISTRICT

Raglan	555,737	76.9	427,362
Waikato	215,411	82.2	177,068
Waipa	222,469	83.2	185,094
Otorohanga	201,351	82.6	166,316
Kawhia	82,569	78.9	65,147
Waitomo	446,666	82.5	368,499
Taumarunui	149,567	85.4	127,730
Coromandel and Thames	54,152	80.3	43,484
Hauraki Plains	24,304	84.7	20,585
Ohinemuri	34,304	88.4	30,325
Piako	146,421	80.8	118,308
Matamata	365,583	79.2	289,542
Tauranga	195,205	81.0	158,116
Rotorua	199,635	91.3	182,267
Taupo	48,681	90.6	44,105
Whakatane	63,009	90.4	56,960
Totals	3,005,064	81.89	2,460,908

TARANAKI LAND DISTRICT

Ohura	146,310	83.2	121,730
Whangamomona	63,717	92.0	58,620
Clifton	103,737	80.2	83,197
Taranaki	33,484	88.7	29,700
Inglewood	70,278	93.9	65,991
Egmont	33,675	99.5	33,507
Stratford	139,285	93.8	130,649
Eltham	70,064	96.0	67,261
Waimate West	9,299	91.0	8,462
Hawera	84,628	90.5	76,588
Totals	754,477	89.56	675,705

HAWKE'S BAY LAND DISTRICT

County	Breeding ewes (as at 1955)	Estimated percentage of lambs	Estimated number of lambs
Wairoa	422,535	78.3	330,845
Hawke's Bay	1,055,788	90.5	955,488
Waipawa	494,099	94.8	468,406
Waipukurau	169,413	92.1	156,029
Patangata	561,128	86.1	483,131
Dannevirke	343,743	102.8	353,368
Woodville	99,999	99.5	99,499
Weber	59,905	89.1	53,375
Totals	3,206,610	90.44	2,900,141

GISBORNE LAND DISTRICT

Opotiki	55,225	79.2	43,738
Matakaoa	58,512	84.0	49,150
Waiapu	256,594	76.0	195,011
Uawa	104,585	79.2	82,831
Waikohu	353,107	83.1	293,432
Cook	454,487	83.4	379,042
Totals	1,282,510	81.34	1,043,204

WELLINGTON LAND DISTRICT

Patea	238,486	91.3	217,738
Kaitieke	89,684	90.8	81,433
Waimarino	203,233	95.6	194,291
Waitotara	159,712	85.4	136,394
Wanganui	293,463	85.1	249,737
Rangitikei	1,042,686	95.7	997,851
Kiwitea	299,259	98.0	293,274
Pohangina	155,671	96.9	150,845
Oroua	264,288	100.9	266,667
Manawatu	157,616	95.7	150,839
Kairanga	120,110	94.0	112,903
Horowhenua	131,091	90.0	117,982
Hutt	70,922	85.8	60,851
Makara	47,474	78.4	37,220
Pahiatua	177,269	96.7	171,419
Akitio	158,453	80.2	127,079
Castlepoint	98,809	87.1	86,063
Eketahuna	152,280	92.1	140,250
Mauriceville	53,774	91.7	49,311
Masterton	330,544	85.9	283,937
Wairarapa South	198,373	86.4	171,394
Featherston	372,587	79.8	297,324
Chatham Islands	46,702	75.0	35,027
Totals	4,862,486	91.10	4,429,829

MARLBOROUGH LAND DISTRICT

Sounds	88,725	68.9	61,132
Marlborough	257,010	92.0	236,449
Awatere	188,573	91.9	173,299
Kaikoura	133,046	85.0	113,089
Totals	667,354	87.51	583,969

LAMBING ESTIMATES . . .

NELSON LAND DISTRICT

County	Breeding ewes (as at 1955)	Estimated percentage of lambs	Estimated number of lambs
Waimea	175,354	92.8	162,729
Takaka	27,768	88.8	24,658
Collingwood ..	13,800	83.0	11,454
Buller	2,572	92.5	2,379
Murchison ..	33,050	87.5	28,919
Inangahua ..	21,222	89.8	19,057
Totals	273,766	91.03	249,196

WESTLAND LAND DISTRICT

Grey	37,917	97.5	36,969
Westland	41,885	105.9	44,356
Totals	79,802	101.91	81,325

CANTERBURY LAND DISTRICT

Amuri	256,474	87.1	223,389
Cheviot	165,719	91.2	151,136
Waipara	338,173	109.0	368,609
Kowhai	105,081	111.0	116,640
Ashley	76,779	99.6	76,472
Rangiora	65,958	112.8	74,401
Eyre	80,292	108.0	86,715
Oxford	102,263	105.2	107,581
Tawera	53,448	74.3	39,712
Malvern	204,402	108.6	221,981
Paparua	60,063	112.4	67,511
Waimairi	3,814	112.1	4,275
Heathcote	8,967	92.3	8,277
Halswell	19,217	97.7	18,775
Mount Herbert ..	38,150	103.3	39,409
Akaroa	86,607	104.8	90,764
Wairewa	72,529	101.0	73,254
Springs	43,746	112.5	49,214
Ellesmere	109,122	111.9	122,108
Selwyn	182,688	90.4	165,150
Ashburton ..	1,107,343	108.1	1,197,038
Geraldine	342,781	99.4	340,724
Levels	267,022	110.4	294,792
Mackenzie ..	321,721	88.9	286,010
Waimate	620,546	103.3	641,024
Totals	4,732,905	102.79	4,864,961

OTAGO LAND DISTRICT

Waitaki	538,298	105.0	565,213
Waihemo	119,013	103.0	122,583
Waikouaiti ..	84,808	91.0	77,175
Peninsula	23,276	110.5	25,720
Taieri	202,991	95.5	193,856
Bruce	322,704	104.5	337,226
Clutha	625,886	105.0	657,180
Tuapeka	441,051	97.3	429,143
Maniototo ..	255,273	97.5	248,891
Vincent	278,582	98.5	274,403
Lake	144,826	89.0	128,895
Totals	3,036,708	100.78	3,060,285

SOUTHLAND LAND DISTRICT

County	Breeding ewes (as at 1955)	Estimated percentage of lambs	Estimated number of lambs
Southland ..	2,497,311	114.0	2,846,935
Wallace	791,731	102.5	811,524
Stewart Island ..	2,845	71.0	2,020
Totals	3,291,887	111.19	3,660,479

DISTRICT ESTIMATES

North Auckland ..	992,789	81.98	813,895
South Auckland ..	3,005,064	81.89	2,460,908
Gisborne	1,282,510	81.34	1,043,204
Hawke's Bay ..	3,206,610	90.44	2,900,141
Taranaki	754,477	89.56	675,705
Wellington ..	4,862,486	91.10	4,429,829
Marlborough ..	667,354	87.51	583,969
Nelson	273,766	91.03	249,196
Westland	79,802	101.91	81,325
Canterbury ..	4,732,905	102.79	4,864,961
Otago	3,036,708	100.78	3,060,285
Southland ..	3,291,887	111.19	3,660,479
Totals	26,186,358	94.80	24,823,897

Dominion Totals

The following table shows the estimated lambing for the North and South Islands for the previous 5 years together with the number of lambs tailed.

Year	Number of breeding ewes	Estimated percentage of lambs	Estimated number of lambs	Number of lambs tailed
NORTH ISLAND				
1955 ..	14,103,936	87.38	12,323,682	—
1954 ..	13,529,687	89.63	12,126,101	12,444,533
1953 ..	13,097,679	96.24	12,605,517	12,836,745
1952 ..	12,717,819	93.10	11,839,659	12,007,684
1951 ..	12,620,097	91.75	11,579,023	11,876,012
1950 ..	12,227,145	93.96	11,489,151	11,722,316
SOUTH ISLAND				
1955 ..	12,082,422	103.46	12,500,215	—
1954 ..	11,320,843	103.01	11,662,121	11,794,656
1953 ..	10,683,697	98.52	10,526,302	10,758,060
1952 ..	10,245,527	96.78	9,916,102	10,154,586
1951 ..	10,018,394	97.59	9,777,423	9,938,012
1950 ..	9,654,322	97.77	9,438,768	9,516,145
DOMINION				
1955 ..	26,186,358	94.80	24,823,897	—
1954 ..	24,850,530	95.73	23,788,222	24,239,189
1953 ..	23,781,376	97.27	23,131,819	23,594,805
1952 ..	22,963,346	94.74	21,755,761	22,162,270
1951 ..	22,638,491	94.34	21,356,446	21,814,024
1950 ..	21,881,467	95.64	20,927,919	21,238,461

Diseases of Turkeys

By A. C. HOWSE,

Veterinarian, Department of Agriculture, Christchurch

OWING to the increasing interest in the raising of turkeys for table use "The Journal of Agriculture" in recent months has published a series of articles on the rearing of turkeys. This article, which concludes the series, lists diseases which affect turkeys and describes symptoms, preventive measures, and curative treatments.

DISEASES described here include virus, fungous, and vitamin deficiency diseases and external and internal parasites.

Blackhead

Blackhead is the commonest and most widespread disease of turkeys wherever they are kept on a commercial scale. It is also known as infectious entero-hepatitis because lesions are seen in the liver and intestines as well as in the head. In fact the liver and intestinal lesions are more constant and obvious than those in the head. The name "blackhead" is probably derived from darkening of the red parts of the head, a symptom liable to occur in almost any disease condition.

Symptoms

The birds are mopy, stand about with ruffled feathers, and frequently show yellowish diarrhoea. Sickness often lasts for 2 to 3 days and is generally followed by death, though a few affected birds may live longer.

Post-mortem Appearances

The blind guts or caeca are inflamed and ulcerated. In some cases, generally birds which have the disease longer before dying or recovering, the blind guts may contain yellow, cheese-like exudate.

The liver is dotted with small, yellowish patches over all or most of its surface.

Cause

The cause of this disease is what is known as a protozoan parasite. The protozoa are one-cell organisms, and the one which causes blackhead is known as *Histomonas meleagridis*. It multiplies in the intestines of affected birds and is passed out in their droppings. It is then picked up from the ground by others in which it also causes the disease. Thus the cycle of infection is continued as long as susceptible birds are kept on infected ground.

The treatment of affected birds is of doubtful value. Prevention is the only economic means of reducing losses.

Prevention

Ordinary fowls are carriers of blackhead and are also susceptible, though far less than are turkeys. Therefore, fowls and turkeys should not be run together. Older turkeys may also be carriers and should be kept separate from young stock.

Turkey poults should be reared on open range which should be as high and dry as possible. Food and water troughs should be kept clean and the area surrounding them should be dry.

The caecal worm, *Heterakis gallinae*, assists the life cycle of the blackhead parasite, as one stage of the *Histomonas* is passed inside the egg of the worm, which protects it from outside influences. Therefore, birds affected with the worm should be dosed as required with phenothiazine to keep them as clear as possible. This drug should be given at 1lb. per thousand birds.

Sinusitis

Sinusitis is frequently referred to as nasal catarrh. The probable cause is a virus.

Predisposing Causes

A deficiency of vitamin A causes inflammation of the sinuses with discharge. This however is not true sinusitis, but is a predisposing cause. Sinusitis is an infectious disease and therefore differs from the deficiency condition.

The disease affects turkeys 3 to 3½ months old. They become mopy with a discharge from the eyes and nose. Most birds recover eventually.

Control

Introduction of carriers should be avoided as far as possible by isolating new birds for a period of 1 month. This, however, is not a certain preventive, as some carriers may show no symptoms. Adequate diets should be provided at all times.

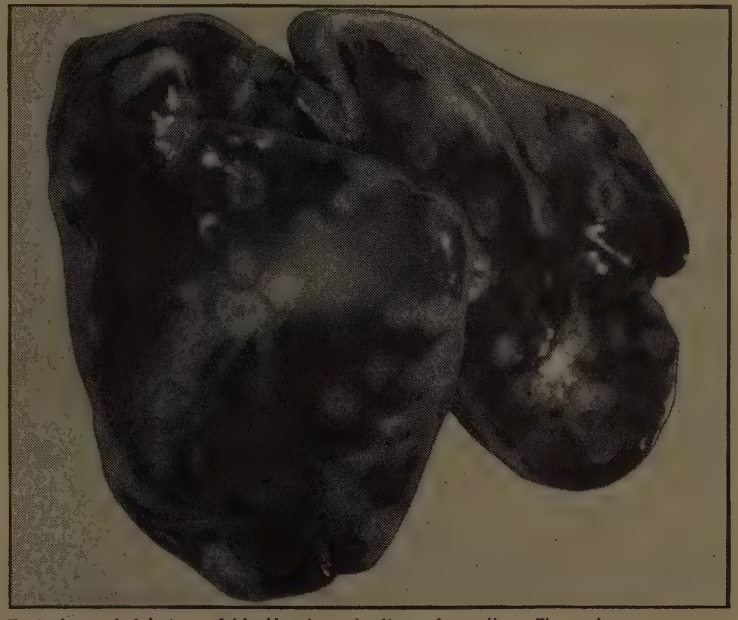
Treatment

This condition can be effectively treated by emptying affected sinuses of mucus. This is done with a large-bore hypodermic needle which is inserted into the sinus, the exudate then being sucked out by a syringe. After this an injection of 1 c.c. of 4 per cent. silver nitrate in distilled water should be made into the sinus. This can be done through the same needle, which is left in position until the injection has been made.

Deficiency Diseases

Vitamin A Deficiency

Turkeys are susceptible to deficiency of vitamin A, and deficiency should be prevented by providing young stock with adequate quantities of good greenfeed. If there is any doubt about the quality of the greenfeed or its vitamin content, a fish liver oil should



Typical rounded lesions of blackhead on the liver of a pullet. These ulcers are common in affected turkeys.

be incorporated in the mash at 1½ pints per 100lb. of mash if the oil contains 1000 units of vitamin A, or ¾ to 1 pint per 100lb. of mash if the oil contains 2000 units of vitamin A.

Riboflavin Deficiency

Riboflavin is required by growing turkeys and is contained in fresh, good greenfeed, milk products, yeast, fresh liver, and liver meal.

Symptoms of deficiency are shown by slow development and in more extreme cases by leg weaknesses. Badly affected birds go about on their hocks. This extreme condition readily responds to the administration of yeast, skimmed milk, or fresh liver.

Vitamin D Deficiency

It is well known that deficiency of vitamin D causes rickets in most animals, and turkeys are no exception. This deficiency results in poor growth, swelling at the joints, particularly the hock joint, and soft beaks and bones. It is readily prevented or corrected by the provision of good-quality fish liver oil, the same quantities of oil being used according to vitamin content, as described above.

Oils with 1000 units of vitamin A contain 100 units of vitamin D and those with 2000 units of vitamin A contain 200 units of vitamin D. It is also manufactured in the body through the action of ultra-violet light or direct sunlight on the skin. Adequate calcium, generally provided as limestone grit, should also be available.

Fowl Pox

A virus disease, fowl pox is commonest in fowls, but turkeys are also susceptible. Fowl pox is quite common in fowls in the North Island. Until 1955 it had never been known in the South Island, which was rather surprising, as it has long been common in Britain and other countries of similar climate. However, in 1955 it did occur in fowls in the South Island, where energetic action was taken by officers of the Department of Agriculture and it was stamped out.

Though turkeys are susceptible, the disease is less common in them than in fowls (in Great Britain at least), and there do not appear to be any records of fowl pox in turkeys in New Zealand. However, it is apparently known in turkeys in Australia, and therefore there is no reason why it may not appear some time in this species in New Zealand.

The symptoms in turkeys are similar to those in fowls. Small chicken pox-like eruptions occur on the unfeathered parts of the head. Once these develop and the disease has started it will run its course no matter what is done. There may also be yellow ulcers on the mucous membrane within the mouth.

Prevention consists of vaccination with fowl pox vaccine, which is produced in New Zealand and is available if required. On properties overseas where the disease occurs regularly all poults are vaccinated at the age of 12 weeks and they are thereafter immune for life. However, at present there does not appear to be any justification for the use of this vaccine on turkeys in New Zealand, as there is a risk that vaccination may introduce the disease. It should not therefore be used on properties in districts which have hitherto been free of the disease.

Aspergillosis

Aspergillus fumigatus is the organism which causes aspergillosis or so-called brooder pneumonia in chicks. Turkey poults are also susceptible, though at a later age than that at which the disease sometimes appears in fowls. In ordinary fowls infection can occur from the day-old chick stage onward.

In turkeys it is more poults on range which may become affected. The fungus is found in mouldy, dusty hay, straw, and other litter, and young turkeys may become infected from these sources.

There is no effective treatment, and prevention consists in keeping birds away from such material.

Parasites

Externally turkeys may become infested with lice and heavy infestations may be fatal to young turkey chicks. Such cases may occur when turkey chicks are being reared under a broody hen. If the hen is lousy, the chicks may become infested from her.

Lice, however, can be easily eliminated by dusting with an insecticide. Broody hens and chicks should be treated in this way as required.

Internally, turkeys are susceptible to infestation with *Ascaridia* and *Heterakis* species and also to tapeworms. *Ascaridia* are roundworms occurring in the small intestine. They are quite large, white or grey, and are easily seen. *Heterakis* is the small caecal worm, which is quite well known. It occurs in large numbers in the blind guts or caeca.

Of these parasites the common roundworm is the most important. It is similar to the ordinary roundworm of fowls. Both it and the caecal worm are susceptible to treatment with phenothiazine, which is available in New Zealand in proprietary preparations. It should be administered in accordance with the manufacturers' directions, but only if worm infestation is known to exist.

So-called preventive feeding in the daily mash over lengthy periods of remedies for this and other conditions such as coccidiosis is often only a waste of money. With turkeys, as with fowls, prevention of disease by good management is always preferable and is infinitely cheaper than attempts to make up for bad conditions by reliance on regular dosing with patent preparations.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during November and for the 4 months ended 30 November 1955, with comparative figures for the same month and 4 months of 1954, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
November 1955	24,925	441	25,366	—
November 1954	23,884	461	24,345	—
Increase or decrease	+1,041	—20	+1,021	+4.194
4 months ended 30/11/55	73,783	1,230	75,013	—
4 months ended 30/11/54	70,914	1,269	72,183	—
Increase or decrease	+2,869	—39	+2,830	+3.920

Butter in store at 30 November 1955 was 22,903 tons.

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
November 1955	12,307	2,097	14,404	—
November 1954	11,755	4,258	16,013	—
Increase or decrease	+552	—2,161	—1,609	—10.048
4 months ended 30/11/55	29,990	4,131	34,121	—
4 months ended 30/11/54	30,807	8,358	39,165	—
Increase or decrease	—817	—4,227	—5,044	—12.879

Cheese in store at 30 November 1955 was 18,308 tons.

If these figures are converted into butterfat equivalent, there is an increase of 0.621 per cent. in butterfat graded for the 4 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Further Investigations into Use of Sulphur in North Otago

By
W. R. LOBB, Assistant Fields Superintendent, Department of Agriculture, Christchurch, and D. G. REYNOLDS, Instructor in Agriculture, Department of Agriculture, Oamaru

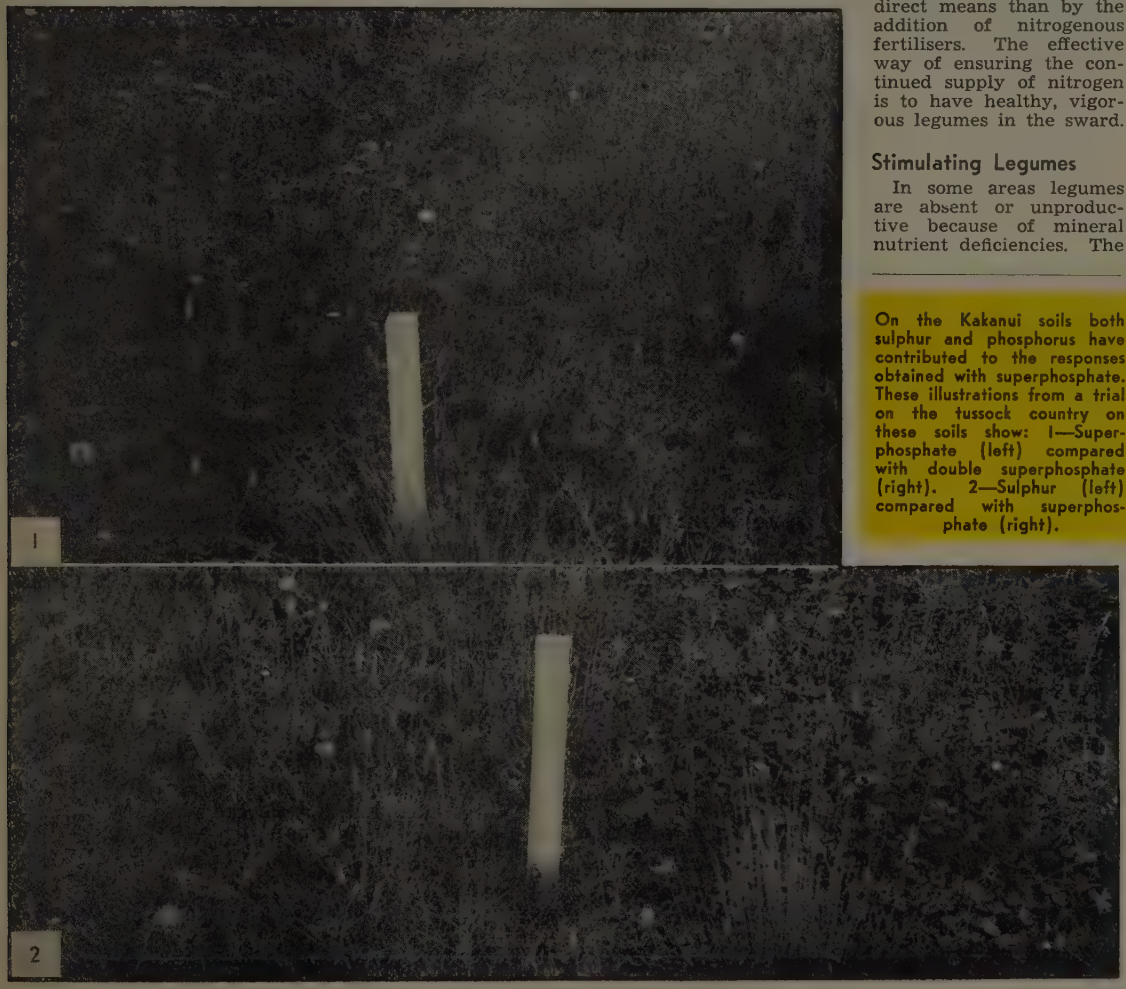
FURTHER research work into the use of fertilisers containing sulphur on a number of soils in North Otago was conducted in 1954-55. To bring the previous information up to date this article discusses the soils and fertilisers used in trials covering the downlands and coastal area of Waitaki County. The implication is that a wide variety of soil types is responsive to sulphur. Further information on rates and duration of effect has been given for both pasture and crops. Gypsum (calcium sulphate) has been included in the new series of trials and a discussion on the types of sulphur has been possible.

FARMING of the low foothill and downland areas of North Otago is governed largely by low rainfall. Within this area there is a great variety of soils with variations in topography from flat to steeply rolling, and it is necessary to depend on growing supplementary fodder to offset summer and winter shortages, since pasture production cannot meet all requirements.

One essential lacking in the majority of pastures is thriving legumes. Under such conditions the grasses become dependent on mineralised soil nitrogen, and in areas of low rainfall and drying winds the provision of this nitrogen, or nitrogen from the breakdown of accumulated vegetation, becomes negligible. Though this sequence reflects a low nitrogen status throughout most of the district, it is probably better to approach the restoration of this by indirect means than by the addition of nitrogenous fertilisers. The effective way of ensuring the continued supply of nitrogen is to have healthy, vigorous legumes in the sward.

Stimulating Legumes

In some areas legumes are absent or unproductive because of mineral nutrient deficiencies. The



On the Kakanui soils both sulphur and phosphorus have contributed to the responses obtained with superphosphate. These illustrations from a trial on the tussock country on these soils show: 1—Superphosphate (left) compared with double superphosphate (right). 2—Sulphur (left) compared with superphosphate (right).

Using molybdenised superphosphate farmers have had excellent results with winter sowing of clovers into tussock land. Molybdenum, phosphorus, and sulphur have all contributed. Results with concentrated phosphates have been negligible.

addition of practically all the artificial fertilisers on pasture land aims simply at stimulating legume growth. This applies to phosphate, potash, lime, and molybdenum. Where additions of other essentials, such as boron, zinc, magnesium, copper, and manganese, have been found necessary on pasture it is generally emphasised that their value lies in the improvement of clover growth and the indirect effect of this is to apply nitrogen to the other constituents of the pasture. The exception to the above statements is the direct application of nitrogenous fertilisers, which has for some time been a practice in grassland production overseas.

There is a limited range of clovers available for pasture improvement. Generally it is accepted that white and red clovers are the two major ones, with subterranean, *Lotus uliginosus* (*major*), and alsike occupying a lesser place in New Zealand grasslands. For much of the country these clovers are adequate, but practically no investigations have been directed toward other legumes which grow outside the range of normally accepted permanent pasture land such as the arid areas of the plains and foothills of North and Central Otago.

It was noticed that the fertilisers which improved legume growth in North Otago had one feature in common—they all contained sulphur. In work done up to 1954 the investigation of sulphur responses was confined to a limited number of soils and crops and this work was fully covered in the article "Sulphur Investigations in North Otago" in the November 1954 issue of the "Journal".

Work on Various Soils

Rendzina ("Tarry") Soils

The 1955 work has confirmed that responses to sulphur are likely to occur on rendzina or "tarry" soils (Waiareka complex) wherever these occur. Responses can be most confidently expected on old pastures in which clovers, though they may be present, have ceased to thrive. Some pastures on these areas have become devoid of clovers and unless legumes are introduced with the fertiliser, no responses can be expected.

Though the greatest benefits from sulphur are likely to accrue through increased legume growth in pastures, a number of crops, especially brassicas, require the addition of sulphur for maximum growth. The symptoms associated with sulphur deficiency were discussed in the article in the November 1954 issue of the "Journal".

Where tarry soils have been subject to a short rotation and worked intensively for a long period in the fallow both crops and pastures grown appear healthy. This applies to the pasture only in its early years; application of sulphur to these pastures to stimulate the clovers becomes necessary about the third year, even though the proportion of clovers may remain fairly high.

With the completion of 3 years' work on the tarry soils, on which a large amount of work has been done, a reasonably clear picture of fertiliser recommendations emerges:—

1. Clover and crops on these soils do not require phosphorus.
2. Legumes will cease to thrive without the addition of sulphur.
3. Crops of the brassica type and legumes will grow poorly if sown after run-out pasture or after inadequate cultivation.
4. Superphosphate will correct the deficiencies in both crops and pastures if used at a rate sufficient to supply adequate amounts of calcium sulphate.

Summarised, this means that first crops of brassicas, etc., after old lea and a short fallow should always receive fertiliser and that pastures should not be allowed to reach the stage where clovers become unproductive and consequently should be top-dressed regularly. In addition, pastures should be maintained in a relatively short rotation. Where these precautions are carried out cereal crops can be grown without the addition of fertiliser. No worthwhile increases have been recorded with fertilisers in trials with cereal crops.

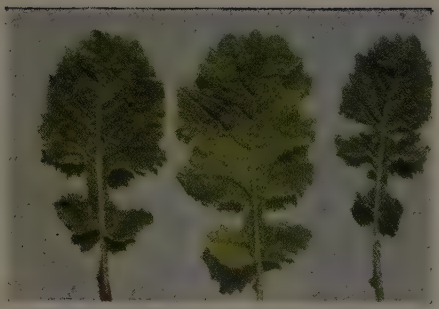
Kakanui Soils

The Kakanui soils consist of a fine loam of young loess type with 4in. to 12in. of weak-structured topsoil overlying a light yellowish, sandy subsoil of varying depth. A trial situated on this soil type at Maruakoa has given interesting results. Most of it is covered in native tussock and introduced grasses such as Yorkshire fog, browntop, and sweet vernal. The trial area, which was devoid of legumes, was oversown with red and white clovers at the time fertiliser was applied.

Results show that both phosphorus and sulphur are necessary to obtain good clover growth, and superphosphate (containing phosphorus and

SULPHUR RESPONSES

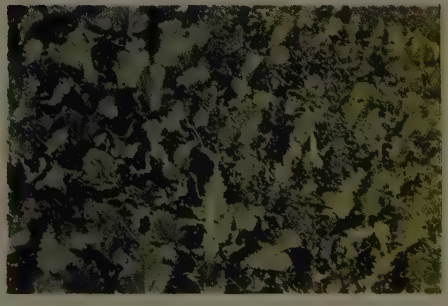
Symptoms of sulphur deficiency in rape. Healthy leaf and leaf showing interveinal yellowing and general stunting, but no marked malformation.



As leaves of rape affected by sulphur deficiency mature a distinct bronzing or premature ripening occurs.

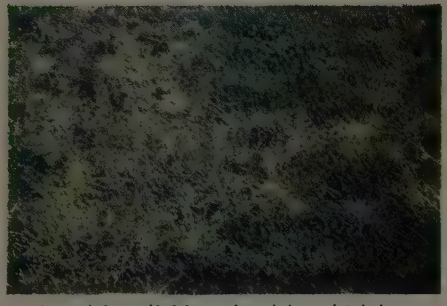
On some leaves symptoms of sulphur deficiency show on one side of the midrib only. This is generally found in cases of mild deficiency.

Response to flowers of sulphur on a rape crop at Totara.



Effect of flowers of sulphur on leaf colour of rape.

The front left plot received no sulphur; clovers are pale and weak.



No sulphur (left) and sulphur (right) on pasture trial at Kakanui.

Double superphosphate (left) and sulphur (right) on pasture trial at Airedale.

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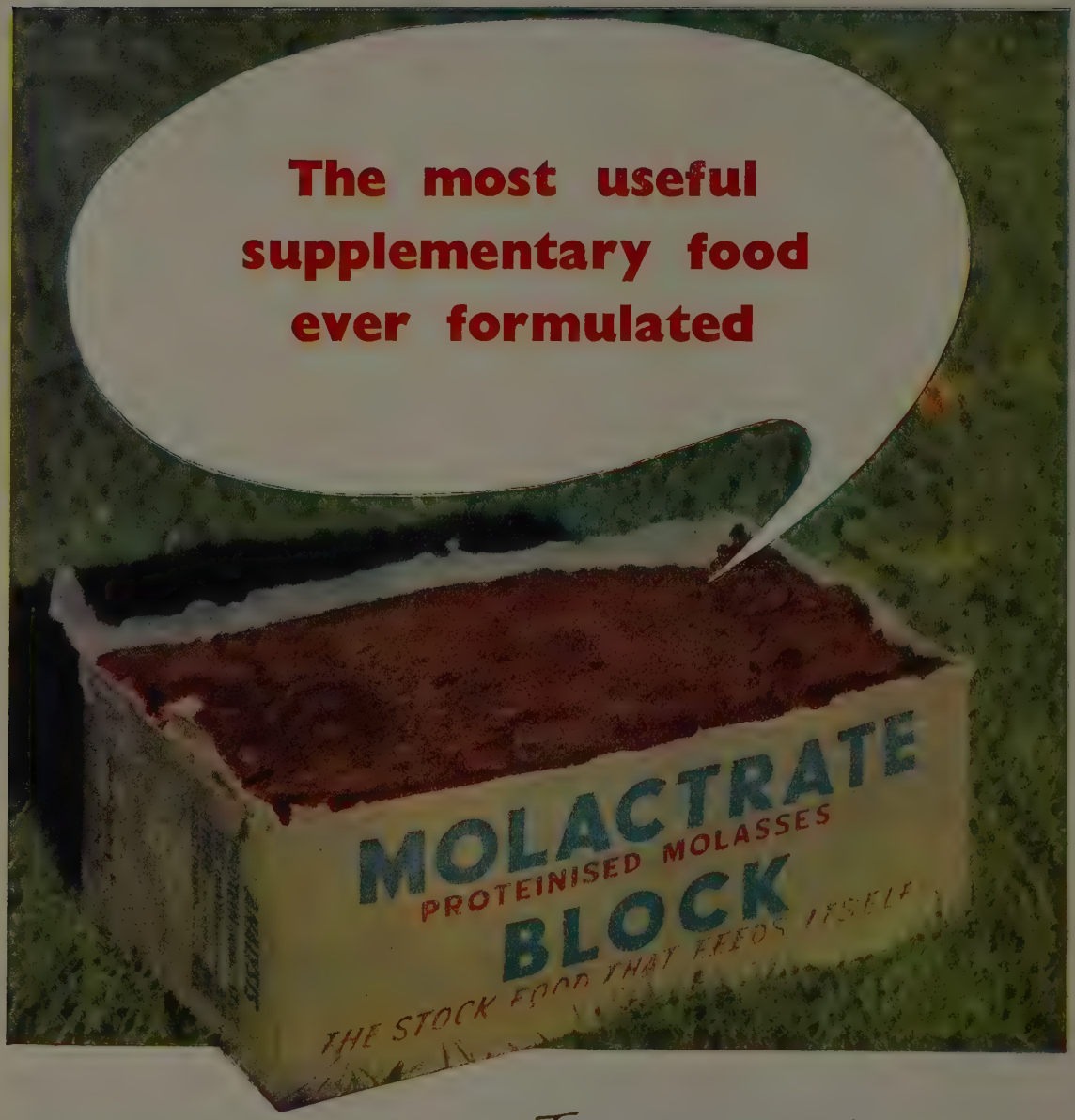

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sulphur) gave very good results. Double superphosphate (which contains no sulphur) gave a slight establishment of clovers, which were yellow and sickly, and sulphur (no phosphorus) gave a weak establishment of clovers of a relatively good colour but low productivity.

This bears out some of the results which have been achieved by farmers using superphosphate and double superphosphate on aerially oversown blocks. With superphosphate spectacular improvements have been achieved, whereas with double superphosphate the native areas have remained virtually unimproved. Because of the extent of the area of this class of country which is being improved throughout the South Island it is probably unwise for farmers to use any of the concentrated fertilisers until there is reliable information available on both phosphorus and sulphur deficiencies.

The major area concerned appears to be the foothill tussock country extending along the Kakanui Range, but it is by no means certain that some inland areas of the district have not a similar problem. Work of Professor Walker of Canterbury Agricultural College and others covering the Canterbury foothills follows a similar pattern and the need for wider investigation is indicated.

The main concern of landholders on this class of country is to avoid the use of fertilisers containing only phosphorus. To define these areas more trial work is necessary and the design and the interpretation of these trials must be such that the relative merits of phosphorus and sulphur can be determined. This must be done before a fundamental approach to the manufacture and utilisation of various fertilisers can properly be applied to grassland topdressing.

Yellow-grey Earths

Yellow-grey earths, which occupy a considerable portion of the low coastal downlands of North Otago, are notoriously deficient in lime, phosphate, and, if they have been excessively cropped, molybdenum. In the past the major feature of improvement of pastures on these soils has been associated with the regular use of lime and superphosphate, and in recent years molybdenum has contributed to restoring the cropped-out lands.

A trial at Herbert on land which had been initially improved by heavy liming and continuous use of superphosphate now shows that the effective portion of the superphosphate used is its calcium sulphate fraction. This trial area is responding well to superphosphate though not to double superphosphate, but the best response was to sulphur only. An interesting feature also was a response to magnesium phosphate, which indicates that at a certain level of improvement factors other than the initial deficiencies may become of some importance.

SULPHUR RESPONSES IN NORTH OTAGO

Plot at left between the pegs received 2cwt. of gypsum per acre. It is surrounded by control plots.

Throughout North Otago there are not a great many areas where sulphur deficiencies of this nature are likely to occur. It is possible to assume that since superphosphate has supplied approximately equal amounts of sulphur and phosphorus, sulphur is the more readily leached.

Coarse Loessial Grey-brown Loams

Coarse loessial grey-brown loams cover some of the inland tablelands of the Waitaki Valley. Where the contour allows these areas have been appreciably cropped in the past and reasonable liming and limited use of fertilisers have not been sufficient to establish good pasture production on them. However, where heavy superphosphate applications have been used pasture production has been good.

Trials above Georgetown indicate again that calcium sulphate has been largely responsible for this improvement. Here also double superphosphate alone has failed, whereas sulphur alone has improved legume growth. In this area clovers remain in the pasture but become unproductive after the second or third year and eventually die out.

Light Stony Silts of the Plains

It has long been expected that the problems associated with pasture production on the light gravelly soils, in so far as moisture would allow, could be rectified by liberal applications of lime and phosphate. The restricted use of fertilisers on these areas has been bound up with the economics of improving soils of low inherent fertility.

Soil tests suggest that applications of lime and phosphate are necessary for the maintenance of pasture growth, but results from trials now in progress indicate that the inferences drawn from the soil analysis may have been incorrect. Two trials show undoubted response to sulphur in the form of gypsum. Once again these soils are notoriously low in nitrogen, but good responses to this nutrient appear to be associated with the addition of sulphur as well. Responses to nitrogen only are fleeting and confined to the inferior grasses originally present. However, the combination of sulphur and nitrogen brings rapid improvement in the legumes and the better grasses in the pastures begin to thrive.

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Forms of Fertiliser under Trial

Throughout the various areas discussed already a number of comparisons between different fertilisers has been made in a large number of trials. From the results the advantages and disadvantages of each of these manures can be discussed. For clarity these will be discussed in groups with emphasis on the main reasons for their use.

Superphosphate, Double Superphosphate, Sulphur, and Gypsum

In the past superphosphate has been considered only from the standpoint of supplying phosphorus to plants, but recently there has been a growing realisation of its importance in supplying sulphur as well. Any discussion on results from use of superphosphate, therefore, must take into account that it supplies approximately equal quantities of phosphorus and sulphur.

New methods of phosphate manufacture have produced the forms known as double superphosphate and triple superphosphate. These contain virtually no sulphur and can be considered as supplying phosphorus only. These forms appeal mainly because with their concentration of phosphates, transport and distribution costs, which are relatively important items for aerial sowing and areas with difficult access, are lower.

The form of sulphur in superphosphate is calcium sulphate and as this material occurs in natural deposits in some parts of the world (not in commercial quantities in New Zealand), it could be supplied commercially. In the trials gypsum is used, as it supplies sulphur in approximately the same form as in superphosphate.

Various grades of elemental sulphur were also compared in the trials. Comparisons of phosphorus alone, sulphur alone, and of sulphur plus phosphorus can be made therefore.

That there are areas on which sulphur is of prime importance in legume growth and for certain crops became evident. During the past year trials have shown that soils at Herbert, Georgetown, Airedale, and on the Waitaki Plains are in this category. In none of the trials in these areas would initial improvement depend on phosphorus. Because of the variation that occurs in soils throughout all these areas, such a recommendation cannot be taken to refer to the whole of any district.

Of the various sulphurs available the quickest-acting form was gypsum, probably because the sulphur in this is a sulphate available directly to the plant. The familiar flowers of sulphur was next, owing no doubt to the fineness of its particles, though it would still have to be converted to a sulphate. The least-available forms were ground agricultural sulphurs, and the larger the particle size was, the slower was the response.

Coarse agricultural sulphur became available too slowly to affect growth on the rape at left. Compare this with the healthy, gypsum-treated block on the right.

For quick-growing crops such as rape a readily available form of sulphur is essential and gypsum was found to remain well ahead of other forms at the maturity of the crop. On pasture gypsum shows up within a week or two and sulphur within a month or two. A fairly long growing period may elapse before the response from sulphur equals that of gypsum.

Lime and Burnt Lime

During the progress of these trials some interesting sidelights emerged on the possible value of liming. On the trials giving sulphur responses lime as calcium carbonate applied without sulphur did not improve clover growth. Surprisingly, however, burnt lime gave excellent results in all cases where sulphur responses were obtained. This discovery alone might lead to some interesting findings on the reasons for sulphur shortages. The following might also have a bearing on results from burnt lime:—

1. Some residue from the coal used in the manufacture of burnt lime could be contained in the burnt lime.
2. A soil sterilising material such as formalin was found to correct deficiency symptoms and improve growth slightly on trial plots. Therefore burnt lime could also act through being a sterilant.
3. The possibility of immediate change in pH with burnt lime might in some way be a factor, though if it were, one might ultimately expect the plots on which carbonate of lime was used to show some improvement. This has not occurred yet.

Some years ago when burnt lime was more widely used merits attributed to it may have involved some of these factors. A number of farmers who had positive results with burnt lime lasting over a long period have not been able to duplicate their results with carbonate of lime.

Sulphate of Ammonia and Ammonium Nitrate-lime

As nitrogen is deficient in so many parts of North Otago, trials were made in many areas with two types of nitrogenous fertiliser, sulphate of ammonia, which contains a considerable amount of sulphur, and ammonium nitrate-lime, which contains no sulphur.

In most trials the initial response to nitrogen showed up irrespective of soil type. On the majority of trials there was not a great deal of difference between the fertilisers in initial response, but on some areas, notably at Totara and on the Waitaki Plains, sulphate of ammonia was much superior from the start.

In the long run wherever sulphur was a limiting factor, sulphate of ammonia proved outstandingly better than ammonium nitrate-lime. In the trials where this occurred sulphate of ammonia owed its effect to stimulation of clover growth, and in some trials this effect was outstanding with red, white, subterranean, and suckling clovers. Where the grasses were poor the increase of the clover was effective in improving them for much longer than the initial effect of the nitrogen in the fertiliser. This was almost certainly due to the sulphur supplied in the fertiliser.

With the ammonium nitrate type of fertiliser, however, the initial effect of the nitrogen was poor and fleeting

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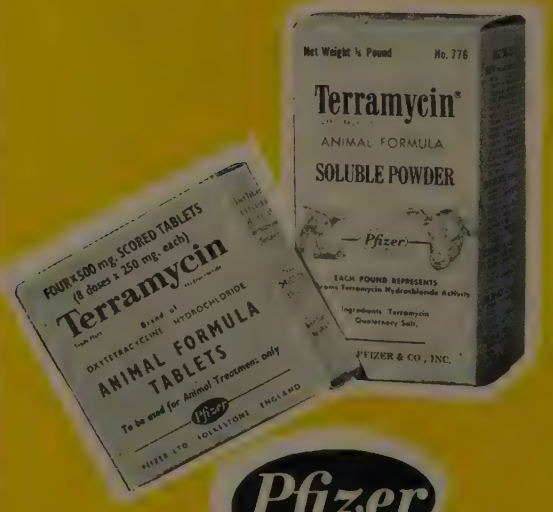

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where the grasses were poor. Where the grasses were young and vigorous both forms of nitrogen gave good production increases, which slumped rapidly when the trials were cut. Where there was an associated sulphur deficiency the clovers remained vigorous where sulphate of ammonia was used, but were weaker with the ammonium nitrate-lime fertiliser.

On a bowling green where sulphur deficiency was suspected the recognised methods of acidifying the green by the use of sulphate of ammonia to eliminate clovers failed, because the sulphur fraction of the sulphate of ammonia stimulated the clovers.

In much of North Otago at least the idea of neutralising nitrogenous fertilisers by the introduction of the ammonium nitrate-lime type of fertiliser, thus avoiding damage to clovers, appears to be quite wrong. In practice the opposite has occurred. In no case has this type appeared any quicker in its action than sulphate of ammonia. Because of these findings, if nitrogen is to be used, it should be in the form of sulphate of ammonia where there is any suspicion of accompanying sulphur deficiency.

Rates of Application

There is not a great deal to add to the information given in the article in the November 1954 "Journal" regarding rates of application of the various forms of the sulphurous fertilisers. With gypsum, however, 1cwt. per acre appeared to be as satisfactory as 2cwt. of superphosphate on crops; on pasture 2cwt. gave a more immediate effect than 1cwt. initially, but after a time there appeared to be little difference between these two rates. At no stage was ½cwt. of gypsum as good as 1cwt.

On the trials sulphate of ammonia was used at 2cwt. per acre, superphosphate at 2cwt., sulphur at 28lb., and burnt lime at 10cwt. No work has been done to determine whether lower rates might be effective except that from previous work 2cwt. of superphosphate is considered near the lower limit where good responses can be expected.

Where other fertilisers were used for comparison ammonium nitrate-lime was applied at 2cwt. per acre, double superphosphate at 1cwt., and limestone at 1 ton.

Sulphur deficiency is apparently widespread in North Otago. Clover response (left) to dressings of sulphur.

Duration of Effects

A dressing of 28lb. per acre of elemental sulphur had a considerable residual effect and production from this treatment remained satisfactory for 2½ years, but by the third autumn its effect had deteriorated almost to the level of that of the control. With 2cwt. of superphosphate deterioration occurred earlier and areas receiving this amount required re-treatment after the second autumn. The areas receiving 1cwt. of sulphur, however, remained highly productive 3 years after treatment.

Gypsum treatments have not been of sufficient duration to confirm their effects, but the 1cwt. dressing is likely to follow the pattern of the 2cwt. application of superphosphate. The lasting effects of burnt lime and sulphate of ammonia have not yet been determined.

A quick-acting form must be used on brassicas such as rape, since the duration of effect is limited to the life of the crop. On crops which take a fairly long time to mature, such as potatoes, a slowly available form may possibly be satisfactory, but little information is available. However, a trial with flowers of sulphur on potatoes gave an immediate and lasting effect. Foliage was darker and the crop showed less tendency to disease, more vigorous top growth, and less likelihood to mature early. Though the trial with 21 varieties was not replicated, a total yield increase of 20.3 per cent. was obtained.

Use of Fertilisers in Relation to District Practice

Present knowledge and the limited data available from soil tests carried out in these trials indicate no correlation between sulphur responses and the results of tests for calcium, phosphorus, and potash content of the soils; nor, indeed, does total sulphur content of the soils appear to be related to the likely response from sulphur applications.

Though a considerable amount of information has been obtained, recommendations cannot be made about all the fertilisers used in these trials. For instance the use of sulphate of ammonia has merit, as it supplies both sulphur and nitrogen, but this need not necessarily mean that the correct balance of these two is supplied by this fertiliser.

Underlying the economics of using fertiliser on North Otago pasture land are factors other than those already considered. The chief of these is damage by grass-grub and porina. Obviously to apply expensive fertilisers to pastures which are going to be completely destroyed by grubs is useless, and farmers must accept the fact that for practically the whole of the district grub proofing in the early life of all pastures has to be considered.

Whole Milk Production for Auckland City

By W. O. McCARTHY,
Agricultural Economist, Department of Agriculture, Auckland

WITH a population of about 362,000 people the Auckland metropolitan area uses 39,000 gallons of milk per day or just under 1 pint per head. This milk is obtained from about 650 farms within a 25-mile radius of the centre of the city, extending more or less from Silverdale in the north to Bombay in the south.

SINCE milking for town supply must be done all the year round, the ideal soil is one that is naturally so well drained that there is not much pugging in winter and early spring. If in addition the soil is moist in summer and autumn, there is an added advantage, but this a rare combination. Because the soils south of Auckland are naturally more fertile and more nearly approach the ideal town supply farm soil requirements than those elsewhere, by far the greater number of whole milk producers are located there.

To the north-west of the city a group of about 70 suppliers is scattered around the Waitemata Harbour through Henderson, Hobsonville, Kumeu, Riverhead, and Coatesville. The country is easy rolling and reasonably well farmed, rising to the west to the scrub and bush covered Waitakere Ranges. Generally these farms are on loamy soils overlying yellow-grey clays (Waitemata complex) requiring more drainage and liberal manuring than the southern area.

A further well-defined group of approximately 35 whole milk producers is found on the North Shore scattered around and south of Albany. Some of this country is less attractive than the other areas, rather hilly, and well wooded. The soils are heavy in texture, being mainly clays and sandy loams with clay subsoils (Waikare clay and Hukerenui sandy loam) and are low in fertility. These soils present difficulties in farm management.

Completing the pattern of town supply farms north of the city is a group of 20 farmers in similar country around Wainui. However, some of these are on easier clay flats (Whakapara mottled clay loam).

Closest to the city are the Mangere and Pakuranga districts, typified by flat or undulating country, well ordered and neatly subdivided. There are about 45 farms in the Pakuranga area and about half are on silt loams with heavy subsoils (Manurewa silt loam) from pumiceous sandstone. Though there is a tendency to pugging in winter, the effect of a dry summer is not so drastic as for example on the other farms in this district, which are

The dots indicate the locations of Auckland City town milk supply farms.

HEADING PHOTOGRAPH: To the north-west of the city of Auckland there is a group of town supply herds. The illustration shows a dairy farm in the rolling country between Henderson and Whenuapai. National Publicity photograph.

on silt loams from water-sorted volcanic ash (Flat Bush silt loam and Papatoetoe silt loam).

Farms on volcanic soils in the Mangere area (Ohaeawai silt loam and Weymouth clay loam and silt loam) suffer most from seasonal dryness. As a group these 60 or more farms are probably the most fully improved and best managed, in spite of summer feed difficulties.

On similar soils farther south the flat and rather featureless East Tamaki area supports a large group of about 80 farms. Around Wiri and Manurewa flatness gives way to undulating country through which are scattered 40 suppliers.

In an area running north-east from Papakura and verging on more broken, untidier country are 60 holdings on a wetter and less easily farmed belt of peaty and meadow soils (Ardmore peaty loam, Kaipaki peaty loam and loamy peat, and Clevedon silt loam).

The largest group of whole milk suppliers is in the Karaka-Waiau Pa district west of Papakura, where about 125 of them farm easy rolling country somewhat less well ordered than areas nearer the city. The soils are brown loams (Karaka complex) of volcanic ash origin, normally not liable to pugging but much inclined to dry out in summer.

The remaining 110 producers cover the area from Paerata down to Bombay and across to the foot of the greywacke and sandstone hills on the east side of the Great South Road. The soil is a rather warm clay loam (Hamilton clay loam).

Future Milk Requirements

A reasonably conservative estimate of the growth of population in the Auckland metropolitan area over the next 20 years is given in the table below.

ESTIMATED POPULATION AND WHOLE MILK REQUIREMENTS OF THE AUCKLAND METROPOLITAN AREA

Year	Population (000)	Milk (000 gals.)	Cows (000)
1955 ..	372	13,150	46
1960 ..	420	15,160	51.2
1965 ..	470	16,970	56.3
1970 ..	510	18,410	61
1975 ..	550	19,860	65

For the year ended August 1954 sales of milk in the Auckland metropolitan area amounted to 13,070,000 gallons. If the per capita consumption remains at the present level, the requirements for 1975 will be 19,860,000 gallons. In the 1953-54 milk year the total production of town supply herds was 18,723,500 gallons or 43 per cent. above the total requirements of whole milk for that year. However, the monthly production and consumption figures tell a different story. In November, a flush month for cows, the production was 84 per cent. above requirements, but in one week in March, owing to very dry conditions, 5077 gallons had to be bought from cheese supply dairy farmers outside the town supply group.

It is unlikely that a much more equal spread in production can be achieved. With regard to the increase in productivity per cow, artificial breeding is already standard practice in some town supply herds, but the increase in milk yield is likely to be less spectacular than the increase in butterfat. On the other hand for one reason or another most town supply farmers will still breed or buy some or all of their replacements. With increasing numbers required it is questionable whether the average standard

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Part of Pakuranga, one of the areas where town milk supply farms are giving way to urban development. White's Aviation photograph.

will be able to rise much. For these reasons a 5 per cent. increase in milk yield over 20 years has been allowed for. Column 4 in the table, showing the number of milking cows required to satisfy the needs of the city, is based on these assumptions. These figures are the actual numbers of cows required to be milked for each year and take no account of other (dry) stock.

An accurate estimate of the additional town supply farms required is not easy, as a number of the present suppliers would like to increase their quotas and also it is probable that circumstances will tend to push up the size of the herds. By 1975 a further 200 to 250 suppliers will probably be needed.

Farm Management Practices

Typical of the smaller, less improved farms north of Auckland is that of Mr. D. A. Fotheringham at Riverhead. Of a total area of 53 acres only about 30 acres are in reasonable pasture. With such a small effective area replacements are not reared on the farm. When necessary, in-calf Friesian or Friesian-cross cows are bought at local sales. A bull is kept to get selected cows in calf again. In the 1953-54 milk season an average of 22 cows was milked for a total production of 25,025 gallons. This works out at 472 gallons per acre, a rather misleading figure owing to the large waste area.

Though the farm is well subdivided, emphasis is not so much on pasture management, renewal, and topdressing as on the feeding of supplements and concentrates. In the 1953-54 season 5 acres of chou moellier and 3 acres of turnips were grown. These were cut or pulled and taken to the cows and lasted from April to September. No hay or silage is fed. Throughout the year brewers' grain mixed with molasses is fed in the bails night and morning. The ration works out at ¾ bushel of grain plus ¾lb. of molasses per cow per day. This practice largely contributes to the high production per cow and it is unfortunate for other farmers that the supply of brewers' grain, a cheap and satisfactory stock food, is limited.

A high-producing farm in the Mangere area is that of Messrs. Kirkbride. On 175 acres 90 cows are milked. Use is made of artificial breeding and two pedigree Friesian bulls are also kept. A few cows are calved down in December and January, the bulk from February to June, and the remainder in spring. About 20 calves are reared (a further 10 are bought in), but when weaned go off the farm until they are brought back to calve down. The biggest problem on this type of country is a dry period extending usually from mid-December to mid-March. To overcome this, 13 to 15 acres of soft turnips are grown and break fed. In addition concentrates are used. In the 1953-54 milk season at this pinch period up to ¾ bushel of brewers' grain was fed per cow each day in the paddock. This season supplies were scarcer than usual and dairy ration at twice the cost had to be resorted to. In the middle of the drought the best cows were getting up to 12lb. of dairy ration per day.

An area of 20 to 25 acres is used for silage to be fed each summer and the aim is to make 2000 bales of hay, which is fed usually from June to September. As well as the normal topdressing (2cwt. to 3cwt. of superphosphate per year plus 1 ton of lime every third year) hay and silage paddocks get 2cwt. of potassic superphosphate per acre. The electric fence is used constantly. Labour is employed to help on the farm. The results of this system of management are reflected in the 1953-54 season's production of 81,871 gallons of milk or 468 gallons per acre.

A different way of maintaining high summer and autumn production is used by Mr. E. G. Charles, of Karaka. He irrigates 37 acres from November to February, aiming to apply 1in. of water per acre per week. In the drought last autumn his 100 milking cows were on and off this irrigated grass constantly. At one stage they were break fed on the area for 6 weeks continuously. The size of the farm is 215 acres and on this are run 120 mature cows (the average number in milk is 100) plus replacements. Most of the calves saved are artificially bred. The aim is to calve most of the cows in January and February and the remainder between March and June.

Of late the emphasis has shifted away from saving a large area of hay and silage (up to 110 acres of silage were formerly cut) to putting in greater areas of root crops for consequent renewal of pasture, the aim being to get round the farm in 10 years. Last spring 6 acres of soft turnips and 28 acres of chou moellier were sown. Break feeding of the chou moellier began at the end of January and these crops are expected to last the cows until September. From 20 to 30 acres of silage are now saved, mainly for the dry stock. In addition 15 to 20 acres of hay are cut. Some is given to the young stock and the milkers get the remainder.

The owner has two cottages on the property and employs two married men. The total production for the 1953-54 season was 110,635 gallons or 515 gallons per acre.

Future Problems

On the one hand town supply and other farm land throughout the area is being utilised for housing and other purposes and on the other hand an increasing amount of milk is required for the people living in these new houses.

In addition market gardens and orchards near the city are being absorbed for housing and industry. As these forms of enterprise command a higher net return per acre than livestock farming, they in turn force the farming perimeter back.

Provision for better access to and egress from the city raises minor problems. Express motorways cut through farms and make them difficult or impossible to work. Some thought is being given to a new international airport at Mangere and this would mean the loss of a small number of town supply farms. The harbour bridge, on which work has begun, the north express road bypassing the built-up areas of Glen Eden and Henderson, and the southern outlet which will probably go at least as far as Papakura all tend to make distant pastures greener. "Green belt" planning could reduce the rate of urbanisation of farm land, though at present there is little obstacle placed in the way of building anywhere to the north and west of the city. In the south there is stricter control.

In any case the future pattern of town supply farms is fairly clear. By 1975 urbanisation will account for about 20 town supply farms around Glen Eden, Henderson, and Te Atatu and a like number on the North Shore on easier country almost to Albany. Around Pakuranga and the northern part of Mangere, already classed as "urban" zones by town planners, 35 to 40 town supply farms will be affected. Further south other farms will go out of production as Papatoetoe, Manurewa, and Papakura expand.

The replacements for these farms and the additional farms required will come largely from within the areas already supplying town milk. For example, the 300 or more town supply farms in Manukau County represent only about 60 per cent. of the total dairy farms. The concentration of whole milk farms around Karaka will probably spread south and south-west. Already suppliers to the Aka Aka cheese factory help out at critical periods. The population of the North Shore is likely to be almost doubled by 1975 owing in part to the harbour bridge. This development will push out the town supply farms on to the easier country around Coatesville and possibly along the main road toward Dairy Flat.

In the foreseeable future, then, it is unlikely that the growth of the city on land at present used for town milk production will bring about any radical change in the existing pattern of town supply farms.

Melting Honey by Steam

PACKING honey for the local market in quantity is not as simple as some beekeepers may think. Continuity of supply is a major consideration, and for the beekeeper to be able to ensure this, honey must be stored in 60lb. tins until it is required for repacking. By then the honey will have granulated hard and will require melting. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, describes a method of doing this when the beekeeper has a supply of steam.

THE disposal of the whole or part of a honey crop on the local market imposes certain obligations on the beekeeper. Merchants require freshly packed honey in various-sized containers at all times of the year, but in varying quantities. The efficient beekeeper therefore has to have some quick method of transforming hard, bulk honey into the required smaller packs. Melting of honey from 60lb. tins has always been something of a problem and various methods are used. Some are slow and tend to darken the honey.

The principle of the method to be described is based on the use of live steam in direct contact with the tins of honey. Though this heat is far above the accepted temperature for honey, no harm is done because the honey as soon as it melts escapes out the opening of the tin. Honey melted in a water bath or a hot room is in contact with perhaps a lower temperature, but for a much longer period. The live steam method is not new; the author made up a unit over 25 years ago and used it continuously for 15 years. Its great advantage is the speed at which honey can be melted and the reasonable running costs where a suitable steam boiler is already installed for other purposes.

Description of Unit

The unit to be described will hold twelve 60lb. tins of honey, but there is no reason why a smaller or larger one could not be made. Certain structural difficulties may be encountered if an attempt is made to build a unit to hold a large number of tins. Several units of the intermediate size would most likely be the most economical to construct.

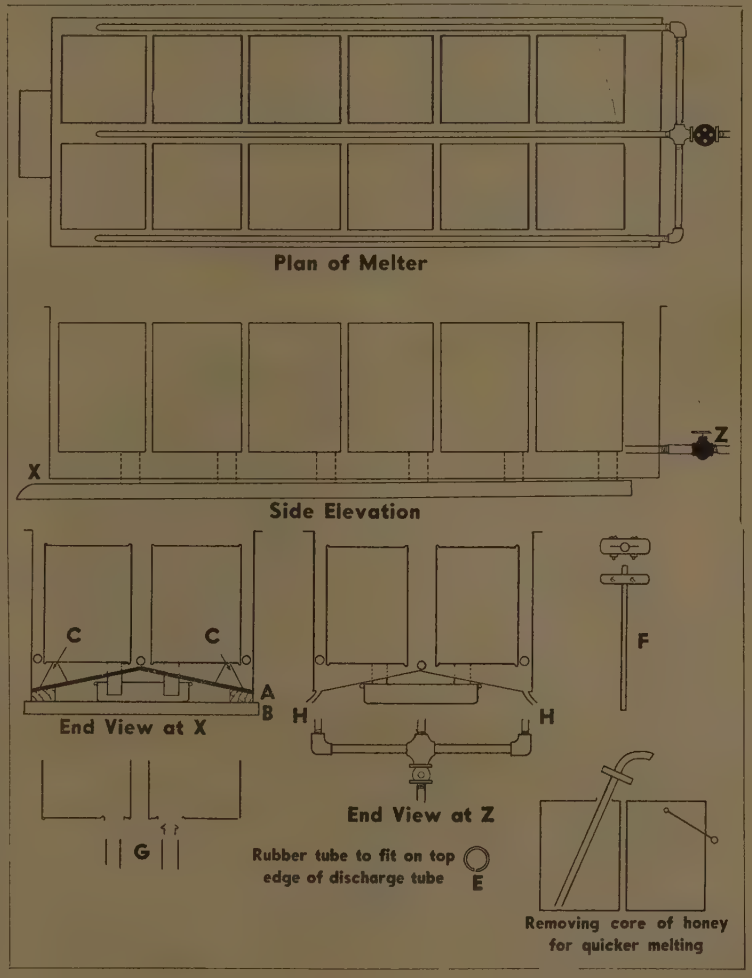
The main tank is rectangular with the bottom made with a slope from the centre to the sides. This allows the condensed steam to run to the sides and thence out the overflow pipes. In the bottom, honey discharge tubes are firmly fixed with hard solder. Each tin of honey is inverted and its opening placed over a tube. The outside ends of each tube lead into a shallow tray which directs the melted honey into a receiving tank. Down the centre of the tank and between the two rows of tins is the steam pipe with numerous small holes drilled in it. On the outside this pipe is connected to the steam supply with a suitable control valve.

The plan of the melter below shows how the tins are evenly placed until the last row is reached; 4in. to 5in. should be left here to allow space for the hand to set the opening of the tin correctly over the discharge tubes. Loading of the melter is therefore started at the other end. A lid of fairly heavy material is required to fit evenly over the tank. Strips of sponge rubber placed in the inside edges will usually make a steam-tight joint. To overcome the necessity for a large receiving tank, a small one to hold approximately 80lb. to 100lb. can be used in conjunction with an automatically controlled honey pump.

A melting unit of this type should not be installed in the packing room. It should be kept somewhere near the steam supply and the honey pumped into the tanks in the packing room. This will also help to reduce the temperature of the melted honey before it goes into the larger tank.

Construction

Metal container: This can be made of heavy-gauge (22) galvanised flat iron. The container is 5ft. 9in. long, 2ft. 2in. wide, and 1ft. 6in. deep. Allowance should be made for a flange of approximately 1in. all round the top. Before the bottom is put in it should be shaped as shown in the end-view diagrams. The centre should be approximately 2in. higher than the edges. At this stage it is best to carry



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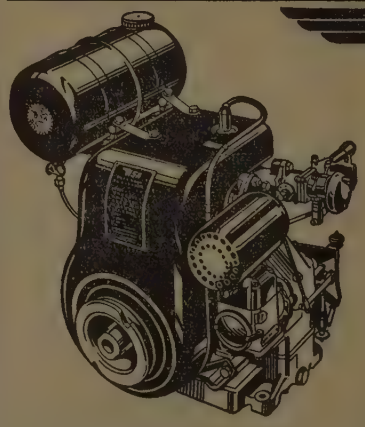

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on with the framework to support the melter. Two 4in. x 2in. beams 5ft. 9in. long are fixed to 4 or 5 cross-pieces (B in end view at X). Five pieces of metal 5/16in. x 2in. are bent to the shape of the bottom of the melter. The end ones can be fixed to A (end view at X), but fixing of the others should be left until the discharge tubes are soldered into place.

Two angle pieces (C) of galvanised iron 5ft. 6in. long can now be fixed to the bottom as shown in the end view at X. A space of 1in. at each end must be left for water to get away. Twelve tubes of approximately 2½in. diameter and 6in. long can be made up of pieces of the sheet galvanised iron. (The size must be checked with the type of tins that will be used.)

The bottom plate is next carefully marked for the position of the discharge tubes. The holes are cut out so that the tubes are a neat fit. Before the tubes are fixed permanently into position with silver solder or a good grade of ordinary solder an empty 60lb. tin should be placed on top and the tubes adjusted to give the tins a slight tilt inward. This will facilitate final emptying of the tins. When the tubes are finally placed in position the bottom can be fixed to the main melter body.

Method of Operation

The tins of honey to be melted are placed on the floor and the lids are removed. After this type of melter had been used several times it was found that the honey that melted at the start had some difficulty in getting out the opening because the bulk of honey prevented ready discharge. To overcome this a small hole was put in the honey right down to the bottom by use of a thin tube about ⅜in. diameter (F in diagrams). This allows melted honey to flow almost immediately from the tin. The tube is pushed into one tin and then when pushed into the next the core of honey that is inside the tube is forced out the top. This core has to be collected and placed in a suitable receptacle for remelting.

If the tins have screw tops, they can then be turned upside down and the openings placed into the discharge tubes. Should some of the tins have small friction lids an adapter lid (G in the diagrams) will have to be used.

A simple way to make a seal between tin and discharge tube is to use a piece of rubber tubing with about ¼in. or 5/16in. outside diameter. This should be cut right down one side (E in diagrams). The cut portion of the rubber can then be placed over the top edge of the discharge tube and cut off to required length. In practice the weight of the 60lb. tin appears to be sufficient to prevent leakage of steam. However, the rubber is desirable and is not very expensive.

The operator must next make sure that the water outlet tubes (H in end view at Z) are not blocked, as otherwise water may accumulate and overflow down the honey tubes. The lid should be placed in position and steam turned on slowly at first. For a start considerable condensation will take place and water will pour out of the outlets H. If no water comes, an immediate check should be made for a blockage. As the unit warms up more steam can be given. In about 10 minutes honey should begin to run down the tray. It will not be melted completely, but will soon melt once the hotter honey begins to flow into the receiving tank.

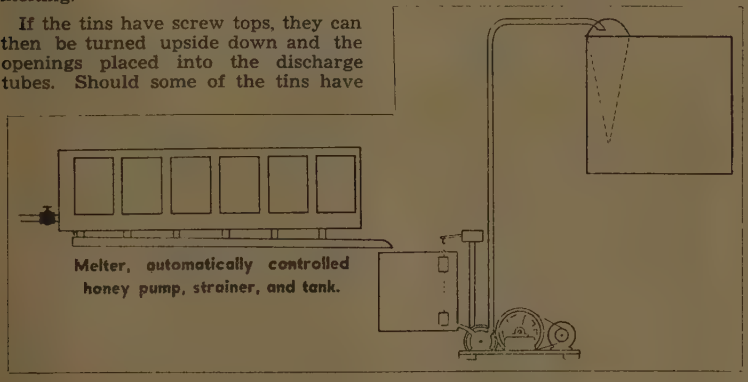
Steam Pipes

The steam pipe down the centre of the melter is ½in. diameter pipe with one end plugged. Holes 1/32in. in diameter are drilled in this pipe to coincide with the position of the tins as shown in the diagrams. If a quicker melt is considered desirable, two extra pipes can be fitted as shown in the plan. However, they should be ⅜in. diameter pipes with a 1/32in. hole drilled opposite each tin.

A steam pressure of from 5lb. to 10lb. appears to be ample for this melter.

Tray

A tray to collect the melted honey and convey it to the receiving tank should be made of tinned steel. It will need to be about 6ft. long and 10in. wide. The sides should be about 2½in. high. The tray is closed at one end and when placed in position is tilted to cause rapid flow of honey to the receiving tank.



Melter, automatically controlled honey pump, strainer, and tank.

Disadvantages

The main disadvantages of this type of melter are that semi-liquid honey cannot be melted and the tins react rather badly to the effects of the steam. They will last several years if cleaned and dried on the outside immediately after use. A rub with an oily rag would most likely help, and a coat of aluminium paint has been suggested to prolong the life of tins.

Running Data

A small experimental unit to hold four 60lb. tins of honey was made up a few years ago and the results of a trial run were as follows:—

Type of honey: Clover in hard granulated condition.

Time of complete melt: 70 minutes.

Maximum temperature of honey recorded: 160 degrees F.

Change in colour due to melting: 1 per cent.

Commercial Unit

In a commercial melting unit now in use in the Oamaru district steam is supplied by a commercial 2-burner pressure boiler and the capacity is twelve 60lb. tins. Results have been as follows:—

Run 1

Time to get steam up: 45 minutes.
Steam turned on: 10.15 a.m.
Honey began to drip from tins: 10.30 a.m.
Honey running freely: 11 a.m. (boiler pressure 15lb.).
Melt completed: 1.15 p.m.
Melting time: 3 hours.

Run 2

Reloaded melter: 1.40 p.m.
Honey began to drip: 1.50 p.m.
Honey running freely: 2.10 p.m.
Melt completed: 4.15 p.m.
Melting time: 2 hours 35 minutes.

Approximately 6lb. of honey was left in the tins and had to be drained out. Apparently some makes of tins are much better than others in this respect.

The amount of fuel used for the two melts was 6 gallons of fuel oil. This gives a fuel cost of melting honey of approximately 4½d. per tin.

The improvement in the melting time of the second run was due to the use of the metal tube which removes a core of honey from each tin. This allows melted honey to escape more readily from the tins.

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5. Tomoana Dog Crackers are a balanced ration—compounded of pure meat and cereal.
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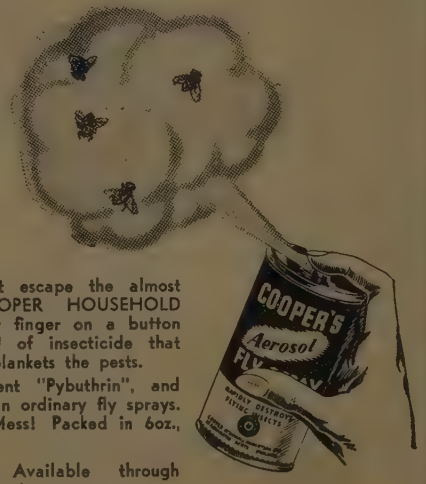

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Good Resolutions and Pig Production

SOME good resolutions regarding pig production that if carried out will assist farmers greatly in making a success of their pigs and, in consequence, increase the profit that they make out of them are suggested in this article by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

THE farmer who breeds all the pigs he requires gets all the profit that is in the pigs himself, but if he buys pigs to fatten, he receives only a portion of this profit, as the man who sells the pigs to him naturally gets a share of it.

In addition to this there is the unpleasant fact that it is all too easy to buy trouble in the form of disease when pigs are purchased, particularly from saleyards. The producer who breeds his own pigs has control over them from the start and can, by efficient management, achieve a rapid growth-rate and avoid the check that pigs nearly always get when they pass from one owner to another.

Selection of Breeding Stock

The farmer who breeds his own pigs must exercise great care in selecting animals for breeding, as the inherent qualities in pig breeding stock vitally affect the quality of the pigs he produces. Sows and boars should not be selected on appearance alone or on the records of their parents at shows.

The really important points are the carcass quality of the strain and its ability to produce and rear large, fast-growing litters of pigs. This information can be obtained from litter-production records, carcass-quality reports, and from the results of baconer and porker carcass competitions. When stock is being purchased for breeding these records should be asked for. They are of far greater importance than the appearance of the animal, though the external carcass characteristics and freedom from faults in the feet, jaws, etc., must also be taken into account.

Fitting Pigs to Feed Supply

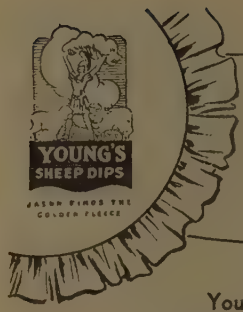
The farrowing dates of sows should be arranged so that the pigs produced fit in with the feed supply. This means that on a dairy farm farrowings should be timed so that the maximum number of pigs is on hand when the supply of skimmed milk or whey is at its greatest. To achieve this on most dairy farms, on which cows calve during July and August, sows should farrow in May and June and again in November and December.

May and June litters can be taken to baconer weight and are sent away to be killed during December and January, as they grow with the feed supply and are never short of food. November-December litters, on the other hand, face a declining food supply in autumn and so should be put off as porkers as they reach the required weights, though a few may reach light baconer weight toward the end of the dairying season in April. Adoption of the system of farrowing suggested means that economical use is made of the dairy by-products available on the farm and that the minimum amount of supplementary food, in the form of either purchased meal or home grown crops, is used.

Creep Feeding Improves Efficiency

It is surprising that numbers of farmers do not make use of a creep for feeding litters. By neglecting to do this they are failing to take advantage of the fact that pigs can make better use of food fed to them in the creep while they are still suckling the sow than they can make of food fed to them at any other time in their lives. This has been abundantly proved, and advantage should be taken of it.

A creep is simply a place where the little pigs can get away from the sow to feed. Creep feeding should begin when the litter is 3 weeks old and meal and skimmed milk or whey should be fed. The meal should be fed dry, preferably in a self-feeder, the reason for this being that piglets will, if meal is always available to them, eat some regularly after suckling the sow. As suckling takes place some 16 times during every 24 hours and just as frequently during the night as during the day, the value of a self-feeder for meal is obvious. Skimmed milk and whey should be fed in a trough three to five times a day, according to convenience, and the trough in which it is fed must be kept clean.



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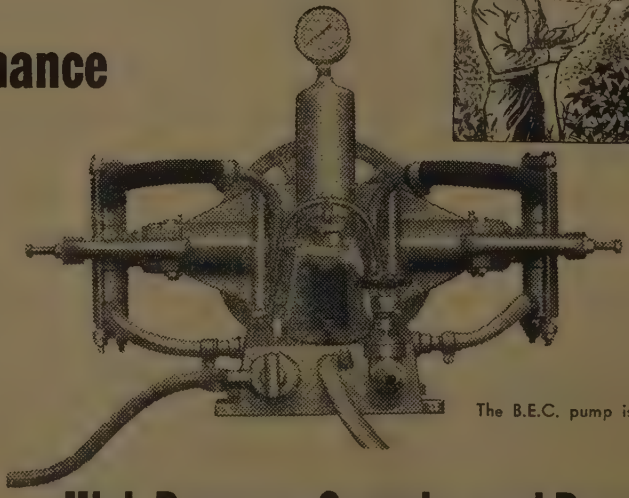

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Feeding the Breeding Sow

If sows are to produce and wean large litters of healthy pigs, they must be properly fed and cared for between the weaning of one litter and the farrowing of the next. A sow normally loses weight during the 8 weeks that she is suckling a litter, and the man who feeds her every day may not notice this, as the loss is gradual. This lost weight must be regained by the sow after weaning if she is to produce another good litter and the only way she can regain it is by being adequately fed.

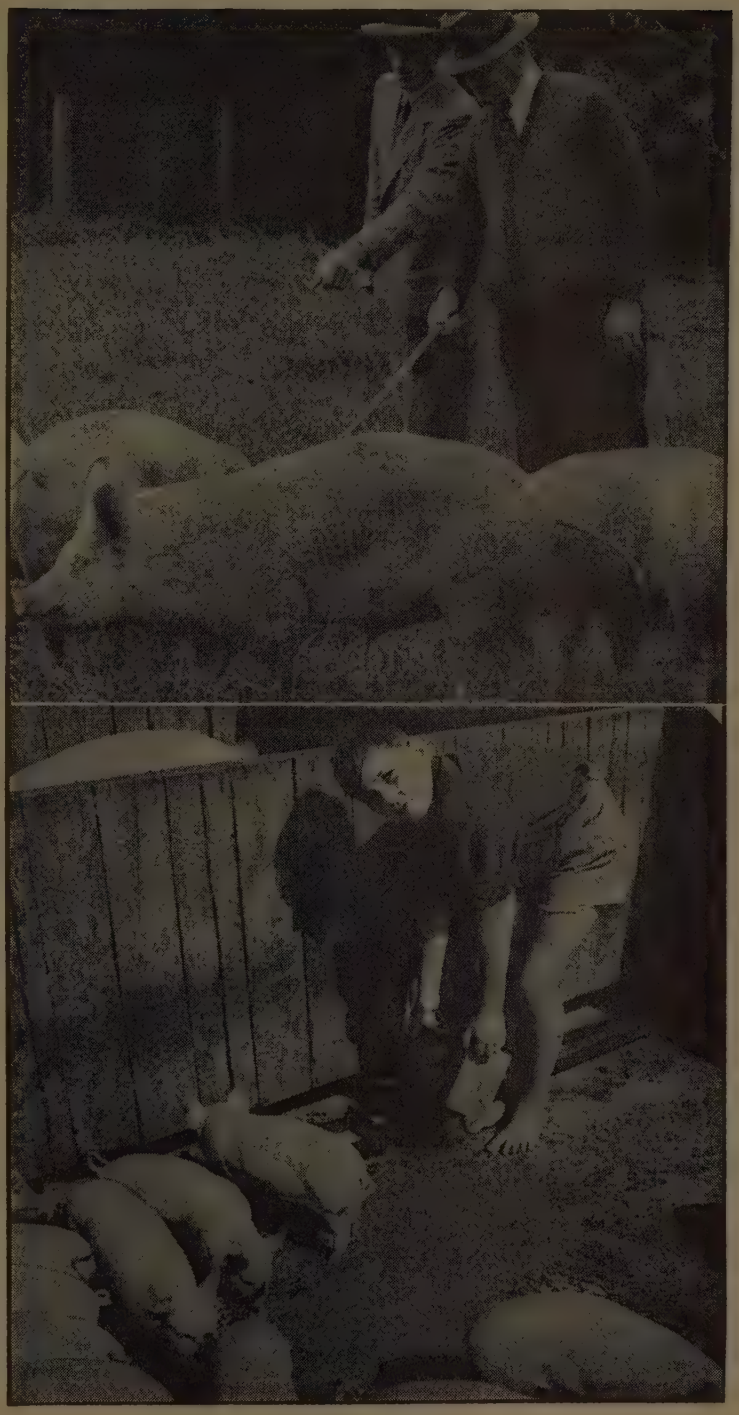
Breeding stock must be selected on performance as well as appearance. →

When a litter is weaned the sow should be taken away from the litter and put in a pen by herself and fed at least 6 gallons of skimmed milk or its equivalent a day. The sow will usually come on heat about 4 or 5 days after weaning and should be put to the boar 24 hours after the onset of heat and again 24 hours later. When settled the sow can be run with other dry sows, provided feeding bails are available to ensure that she gets the right amount of food.

Feeding at a level of 4 to 6 gallons of skimmed milk or its equivalent in meal or crops should be continued for a month to 6 weeks so that the sow may regain lost condition. Once this has been achieved rations may be cut down to 2 gallons per day, provided the sow has free access to good clover pasture and clean drinking water. One month before farrowing the ration should be increased to the 4-gallon level, as the growing litter by this time is beginning to make heavy demands on the sow. The sow should be put into her farrowing quarters a week to 10 days before she is due to farrow to accustom her to them.

Creep feeding produces heavy weaners. →

Boars should be kept in good condition, but not allowed to get too fat. The boar can be run with the in-pig sows for company, and again the use of feeding bails prevents him from damaging the sows at feeding time and from getting too much food. Housing for the boar and dry sows need not be elaborate as long as it is draught free and weather proof. Adult pigs are not nearly as susceptible to changes of temperature as are young pigs and a well-built, open-fronted house is adequate for them.



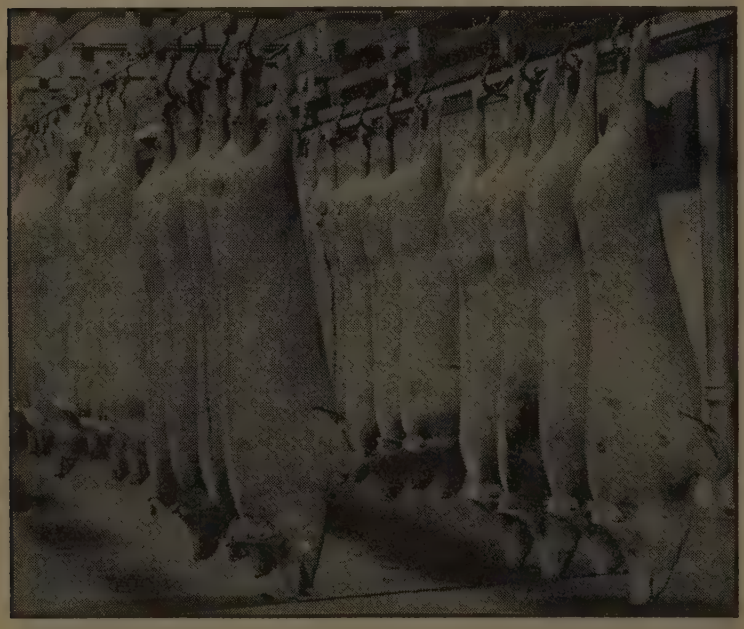
Good management of breeding stock is essential to success.

Care in the feeding and management of in-pig sows and the boar will ensure good results from the litters.

Restricted Feeding of Baconers

Baconer pigs should be fed to produce high-quality carcasses. Far too many good bacon pigs are spoilt by overfatness in spite of all that has been said and written on this subject. This overfatness is due to overfeeding during the last 2 months or after the pigs have reached a liveweight of 150lb.

If a carcass having the amount of fat that purchasers prefer today is to be produced, feeding must be restricted from the time pigs reach a liveweight of 130lb., which means a carcass weight of 90lb. After they have reached this weight pigs can and will, if they are given a chance, consume very large quantities of food and will use it to put on fat. Consequently, to produce a really good baconer the amount of food given daily should not exceed 6 gallons of skimmed milk or its equivalent after a liveweight of 130lb. is reached. Since the rate of gain on a given amount of feed will vary according to the inherent growth ability of the pig, housing, and other conditions it is safer to weigh pigs and restrict gain to approximately 10lb. liveweight per week.



[*Snowden*

Careful feeding is necessary to produce high-quality carcasses.

Reducing Losses of Piglets

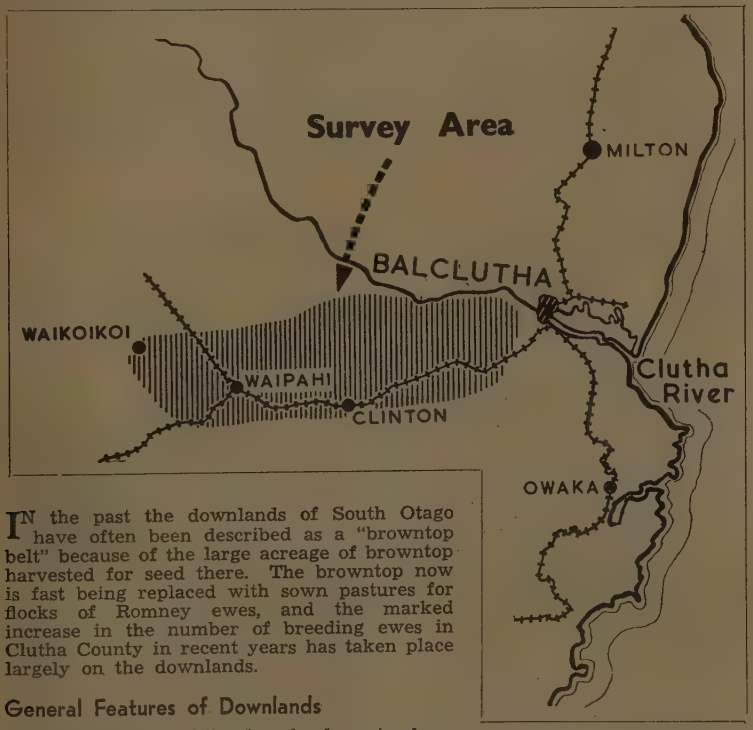
Every effort should be made to avoid losses. By far the greater number of pigs are lost before weaning and the majority of these are lost during the first week after farrowing. To date the best method of cutting down these losses that has been evolved is the round farrowing house developed at the Ruakura Animal Research Station. This design has reduced losses from overlying from 8 per cent. to less than ½ per cent. of pigs born. The houses are not expensive to build and the extra pigs saved very soon pay for the cost of a house. Any farmer who is contemplating building new farrowing houses during the coming year would be well advised to use this design.

An excellent resolution for the pig producer would be that he will concentrate on the foregoing points of good pig husbandry during the coming year. If he does so, he can be sure that his pigs will do better and will return him a handsome profit.

Farm Management Survey of South Otago Downlands

▲ Typical view of the downlands, showing improved pastures and unploughable gullies, which afford some shelter for stock.

IN February 1953 a farm management survey was made of the downlands area of Clutha County in South Otago by a small group of officers of the Department of Agriculture, and in this article (which will be concluded in next month's "Journal") A. H. Mouat, Field Economist, Department of Agriculture, Dunedin, presents the findings of the survey, which relates to the 1951-52 farming year. A general description of farming in the area was given in the February 1954 issue of the "Journal".



IN the past the downlands of South Otago have often been described as a "browntop belt" because of the large acreage of browntop harvested for seed there. The browntop now is fast being replaced with sown pastures for flocks of Romney ewes, and the marked increase in the number of breeding ewes in Clutha County in recent years has taken place largely on the downlands.

General Features of Downlands

The topography of the downlands varies from the easy rolling country of the Warepa-Waiwera district to the stronger rolling country with steep ridges in the Popotunoa area. A silt loam topsoil of 6in. to 10in. overlying a clay subsoil covers most of the downlands, on which the average annual rainfall varies from 42in. at Clinton to under 25in. at Clydevale.

Creeks and springs generally provide adequate water for sheep rearing in the districts with over 30in. rainfall, but the natural supply is not reliable in the drier districts, such as Clifton-Te Houka, where some farms have storage dams and well bores with reticulation by pump systems. In the drier areas shortage of water restricts the number of cattle which can be carried.

Drainage is necessary on the clay soils receiving heavier rainfall and good results have been obtained with tile, mole, and open drains. Without drainage these soils suffer under wet conditions and prove troublesome for the sheep. In the lower-rainfall districts of the downs drainage has proved advantageous on low-lying fields.

There is good natural shelter for stock in the tussock-covered gullies lying between the ridges, but apart from round yards and buildings good shelter belts of trees are not numerous.

The downs generally are well served by rail and road transport. Access to back fields and tussock runs is being improved with the construction of bulldozed tracks, as several farmers have bulldozer blades fitted to their tracklaying tractors for this and other work.

Features of Major Soil Types

The soil map on page 39 shows the distribution of the five major soil types recognised on these clay downs. Table 1, giving the farm data for these soil types, brings out the differences in the average size of farm holdings, farm production, and net financial returns. "Owner's surplus" is the amount available to the farmer as a reward for his labour and management after all farm expenses, depreciation on assets, and interest on the total value of the farm assets have been met. When this amount is divided by the total farm acreage "owner's surplus per acre" is obtained.

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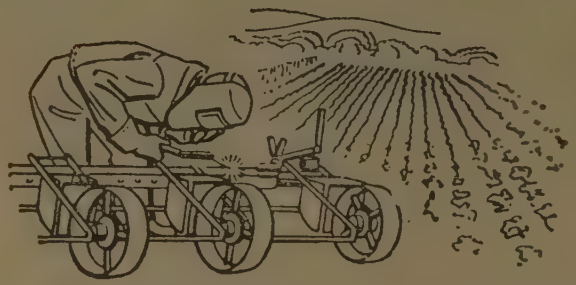

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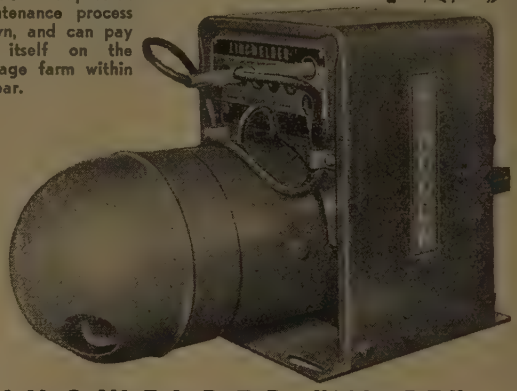

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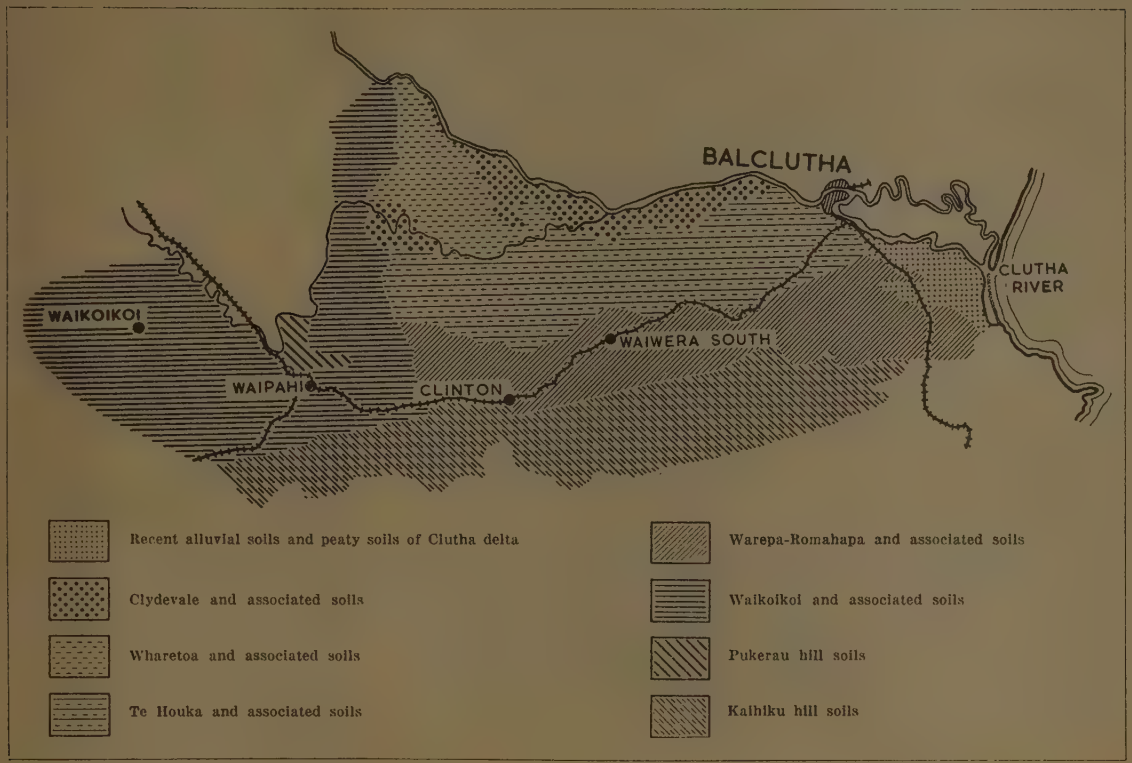

The Clydevale and associated soils have a lower rainfall than other soil types and average farm size is larger on them. The sale of ewe hoggets is a feature on the Clydevale soils, as hoggets shift well from this area. Good production and financial returns are obtained on these drier soils, on which less topdressing of pastures is done and larger acreages of winter feed crops are grown than on the other soil types.

On the Wharetoa and associated soils development work is leading to an increase in sheep flocks, indicated by the number of 2-tooth ewes and ewe lambs being retained on these farms, and will give higher production and returns.

Relatively heavy applications of lime and fertiliser are required on Te Houka and associated soils. Expenditure per acre tends to be higher than on other soil types, but much development work is included in these costs and there is a tendency for more lambs to be bought in for fattening on these farms than elsewhere on the downlands.

There is better farm subdivision on the Warepa-Romahapa and associated soils, and though the majority of the pastures are over 6 years old, their production is high, mainly owing to the greater use of fertiliser and lime for topdressing pastures. Fat lamb production is at a high level, as fewer ewe lambs are retained for replacements and there are few ewe hoggets for sale off these soils.

The Waikoikoi and associated soils are moderately fertile in their natural state. In stock carrying capacity and in financial returns these soils are the best on the downs. In addition to the good receipts from fat lambs, wool, wethers, and ewes there is a substantial income from pasture seeds and cattle.

TABLE I—FARM DATA FOR MAJOR SOIL TYPES AND ASSOCIATED SOILS

Soil type	No. of farms	Average size of farms	Breeding ewes per acre	Production per acre		Owner's surplus per acre
				Wool	Lamb meat	
		acres		lb.	lb.	£
Clydevale	12	627	1.5	20	31	1.8
Wharetoa	10	570	1.4	18	29	1.1
Te Houka	26	550	1.4	18	38	1.4
Warepa-Romahapa	26	412	1.6	20	43	1.8
Waikoikoi	18	550	1.7	21	42	2.5

Purpose of Survey

There are great opportunities for expansion of farm production on this area of downlands by replacement of browntop areas with high-producing pastures for ewes and lambs. The farm survey indicates the results that are achieved by farm development and compares the production of several improved farms with unimproved farms. The financial records show the success that follows from improvement leading to increasing stock carrying capacity and higher crop yields.

Scope of Survey

The area that is studied in the survey is the broad belt of rolling downlands lying within Clutha County between the Kaihiku Ranges to the south and the Clutha River, and extending from Balclutha through Clinton and Waipahi into the West Otago districts of Waikoikoi and Kelso.

More than 100 farms on the downlands were visited, but a few of them were not included in the final study for various reasons. For this study of

farm management the farms were grouped according to their size into 3 groups. Farms under 400 acres are in Group A; the 30 farms in this group occupy 9141 acres or 18 per cent. of the area of the farms in the survey, and the average size of farms is 305 acres. Group B consists of farms between 400 and 700 acres; there are 44, with an average size of 525 acres and a total area of 23,119 acres or 44 per cent. of the survey area. Group C covers farms over 700 acres; there are 23 farms, the average size of which is 860 acres, occupying 19,768 acres or 38 per cent. of the area of farms in the survey. The average size of the 97 farms is 536 acres.

The total area of these farms is 52,028 acres, which represents 22 per cent. or nearly a quarter of the farming land of the downlands in Clutha County.

TABLE 3—LAND UTILISATION, SHOWING WINTER AND SUMMER TOTAL ACREAGES AND PERCENTAGES FOR 97 FARMS

	Winter 1951		Summer 1951-52	
	Total area acres	Per cent.	Total area acres	Per cent.
Sown pastures under 6 years old	18,313	35		
Sown pastures 6 years old and over	8,489	16		
Browntop and tussock	13,887	27		
Available grazing	40,689	78	37,705	72
Winter forage crops	4,414	8	4,605	9
Crops for fattening stock			3,632	7
Land in fallow and stubble	5,481	11	318	1
Cash crops			1,226	2
Area saved for:				
Hay			1,728	3
Pasture seeds			1,370	3
Land in buildings, yards, and plantations and waste land	1,444	3	1,444	3
Total area of farms	52,028	100	52,028	100

Land Classification

On the rolling downlands there is some land on most farms that is unploughable. Though there are some well-developed farms, there are many with a large area of undeveloped land to be improved, as Table 2 indicates.

Developed land is the area known by the present owners to have been ploughed and sown to pastures. Undeveloped land is in browntop, tussock, and weeds.

The figures in Table 2 indicate the stage of land development of the area. The significant figures are those for undeveloped land that is ploughable. Of the total ploughable land 1 acre in every 6 acres is undeveloped.

About one-eighth of the farm land is unploughable.

TABLE 2—TOTAL AREA OF DEVELOPED AND UNDEVELOPED LAND AND AREA OCCUPIED BY FARM BUILDINGS AND YARDS FOR FARMS IN SURVEY ACCORDING TO SIZE GROUPS

Size group acres	Developed land		Undeveloped land				Area occupied by buildings and yards	
	Area acres	Per cent.	Ploughable acres	Per cent.	Unploughable acres	Per cent.	Area acres	Per cent.
A. Under 400	6,796	74	1,289	14	870	10	186	2
B. 400 and under 700	17,806	77	2,312	10	2,329	10	672	3
C. 700 and over	12,095	61	3,521	18	3,566	18	586	3
Total	36,697	70	7,122	14	6,765	13	1,444	3

Land Utilisation

The outstanding feature of Table 3 is the large acreage of grassland. Of the total area of 52,028 acres 51 per cent. has been sown to pasture, a large proportion being in young pasture.

Balclutha, the servicing town for a considerable part of the South Otago downlands. National Publicity photo.

However, many of the sown pastures over 6 years old are low producing and have reverted to browntop and weeds. The 13,887 acres shown as browntop and tussock is undeveloped land, half of which is ploughable.

In summer about a quarter of the farm land is closed to grazing for the production of crops such as hay, pasture seeds and other cash crops, and supplementary feed crops. Of the available summer grazing of 37,705 acres more than a third consists of low-producing pastures (mainly browntop) and tussock. The percentage of a farm in young sown pastures tends to fall as farms increase in size.

Little greenfeed is grown for winter, but young pastures are used for the same purposes as greenfeed. The area in lucerne is negligible and only a small area of pasture is saved for hay. The average yield is just over 2 tons per acre.

Great reliance is placed on crops of soft turnips and swedes to provide the bulk of the winter feed. Of the crops for fattening stock, one-fifth of the 3632 acres is in ridged rape and the remainder is mainly a rape and grass mixture. Cash crops occupy a small average area of all farms, but on individual farms cereal crops may provide an important part of farm income. The main cash crops grown are wheat and oats; others are barley, kale, linseed, and mustard.

Seed crops from pastures include browntop, Montgomery red clover, and white clover and a little perennial and short-rotation ryegrass, crested dogstail, cocksfoot, and timothy. On some farms a good seed crop is a substantial boost to the farmer's income, though the average yields of seed are low. Very little seed is grown on the smaller units, but on the larger farms a farmer may try to harvest a seed crop when sufficient feed for stock is available on the remainder of the farm.

Sown Pastures

As the size of farm increases it is more difficult to preserve the balance of young pasture to old pasture. In Group A (farms under 400 acres) the average farm has 50 per cent. of the total grazing area in young pasture under 6 years old, Group B (400 to 700 acres) has 48 per cent., and Group C over 700 acres) 39 per cent.

On the larger farms more than 60 per cent. of the grazing is old pasture, browntop, and rough unploughable slopes.

As the area sown to new grass in recent years averages 20 acres for farms of Group A, 40 acres for those in Group B, and 50 acres for those in Group C, some pastures remain down too many years before they are renewed. At the present rate of sowing the life of pastures on the ploughable land of the farms averages 10 years in Group A, 9 years in Group B, and 10 years in Group C.

Improved pasture on the downlands near Waiwera South. The paddock in the foreground was hard grazed during summer.

The main aim of farmers is to establish good pastures in place of poor, reverted pastures and browntop swards. On some farms the harvesting of browntop seed on part of the farm assists to finance the development of the rest and so hastens the elimination of browntop.

Drainage

On the soils with higher rainfall a good drainage system is certainly beneficial to pasture growth and to the health of sheep, and in the districts with lower rainfall drainage is advantageous on many fields where the clay subsoil and the lie of the land hinder the run-off of surface water. Many years ago large acreages were covered with mole drains drawn by teams of 12 horses and many miles of tile drains and open ditches were constructed, but with the passing of the years some of these systems have ceased to function.

In recent times the advantages of good drainage have come to be recognised by many farmers on the downlands and the survey showed that more drainage would be beneficial on most of these farms. With efficient tractors and drainage equipment now available and suitable soil and topography over a great part of the downs circumstances are favourable for the construction of mole drainage systems to improve conditions for pasture growth and stock health.

Preparation for Pasture

A few farmers after ploughing old browntop swards let the land lie fallow for a year before sowing swedes. This ensures a good swede crop followed by excellent pasture establishment, but such a long fallow is not common. Without this fallow, to avoid sowing down on the second furrow, a second forage crop or cereal crop may be taken after swedes. The short rotation of grass, swedes, rape, and grass may be achieved by discing and subsequent cultivation of the swede ground instead of by ploughing so that the turf remains buried.

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Harvesting browntop seed with a header harvester. In the past the downlands of South Otago have been described as the "browntop belt", but browntop is now being replaced by good ryegrass-clover pastures.

Seeds Mixture

A general-purpose pasture is the common aim and seeds mixtures show little variation from farm to farm and district to district. Most of the seeds mixtures include 30lb. to 35lb. of ryegrass seed with 4lb. to 6lb. of clovers and 6lb. to 8lb. of other grasses. The total quantity of seed sown ranges from 34lb. on one farm to 53lb. on another farm on a similar soil; both mixtures were broadcast with 1lb. of rape. White clover is included in all mixtures and perennial ryegrass in all but two.

Montgomery red clover is commonly included on the wetter soils and short-rotation ryegrass, cocksfoot, and timothy are sown in most mixtures. A typical mixture of certified seeds sown per acre is:—

	lb.
Perennial ryegrass	20
Short-rotation ryegrass ..	10
White clover	3
Montgomery red clover ..	2
Timothy	2
Cocksfoot	5
	42

A pasture may establish better if the mixture is sown alone with fertiliser, but there is a general need for more fattening feed for lambs than can be provided in the rotation. Sowing down with 1lb. or 2lb. of rape per acre provides extra feed for fattening lambs, and several sowings may be spread over spring and summer so that there is a continuous supply of feed.

The most popular method of sowing pasture is to drill the rape seed with the manure and to broadcast the pasture seed mixture, but cocksfoot and clovers are sometimes drilled. Sowing down of pastures with ryecorn in autumn is done on some farms.

A roller may be used before and after sowing to consolidate the seedbed, or a broadcast box may be fitted on the roller.

Treatment of New Pasture

It is general practice to apply 1 ton of lime per acre on the worked ground before the swede crop and 1½ tons when the pasture is sown. From 1½cwt. to 2cwt. of phosphatic fertiliser is also applied at sowing and in the following spring the new pasture is topdressed with fertiliser at 1cwt. to 2cwt. per acre. The use of fertiliser containing DDT for protection against grass-grub attack is increasing.

A rape and grass mixture is first used for fattening lambs after weaning. This autumn grazing helps to consolidate the ground for the new pasture, which is spelled over the first winter and grazed by hoggets or ewes and lambs in spring.

Control of Pasture Growth

On the South Otago downlands the seasonal growth of pastures is distinct. Spring growth of pastures is rapid and good management is needed to prevent pastures from becoming too rank for sheep grazing. There are various methods of using this pasture growth. In West Otago good utilisation is obtained by heavy stocking with sheep and lambs, beef cattle are carried, and some paddocks are closed up for hay and others are topped with the mower to prevent seeding. By contrast, in the drier districts fewer cattle and sheep are carried, paddocks are larger, and topping with the mower is less common.

The value of having young, highly productive pastures is reflected in the comparison of two groups of farms, one group with a high proportion of farm areas in young pasture and the other with a low proportion of farm areas in young pasture (Table 4).

TABLE 4—COMPARISON OF PRODUCTION ON TWO GROUPS OF FARMS

	High percentage of young pasture	Low percentage of young pasture
Number of farms in groups	10	10
Average size of farms (acres)	458	478
Size range of farms (acres)	206–789	286–700
Percentage of farm acreage in:		
Pasture under 6 years ..	48	21
Other pasture	24	64
Winter and summer forage crops	20	11
Breeding ewes per 100 acres of farm	194	120
Lambing percentage	104	95
Lamb meat sold per acre of farm (lb.)	52	21
Wool production per acre of farm (lb.)	25	14
Average wool shorn per sheep (lb.)	10.3	8.2
Owner's surplus per acre (s.)	46	22

Another two groups of 10 farms with high and low percentages of young pastures had owner surpluses of 29s. 5d. and 19s. 10d. per acre respectively.

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Rotation of Crops

The common rotations as revealed by the survey are:—

Rotations	No. of cases
1. Grass, turnips, grass	40
2. Grass, turnips, forage crop, grass ..	31
3. Grass, turnips, cereal crop, grass ..	16
4. Grass, turnips, cereal crop, rape, grass	13
5. Grass, turnips, rape, wheat, grass ..	12

The two most popular rotations, which are short ones designed to provide winter and summer feed crops and establish new pastures, reflect the initial stage of farm development that applies to much of the downs. In Rotation 2 the forage crop may be turnips or chou moellier, rape, or other greenfeed.

Use of Lime and Fertiliser

Lime has played a major role in the development of the downlands. Some lime has now been applied to most of the ploughable area and some fields on the well-established farms have had 4 to 5 tons per acre. In the renewal of pastures the general procedure is to apply 1 ton on the worked ground before the swede crop is sown and 1½ tons when the pasture mixture is sown. A maintenance dressing of ½ to 1 ton may be applied to the pasture every second year. Most of the lime is now applied by contractors with bulk-spreading machines, though lime sowers are common implements on these farms. The total quantity of lime and fertiliser applied increases with farm size, but the smaller farms use more per acre.

Most farmers appear to be aware of the value of lime; fewer recognise the value of fertiliser in good pasture production. In the farm Groups A and B almost a third of the total pasture is topdressed with fertiliser and nearly a third with lime; farms in Group C fall behind in topdressing practice, only a fifth of the pastures being topdressed with fertiliser and nearly a fifth with lime. On some farms molybdenised fertiliser is giving good responses.

Farm Subdivision

The average size of paddock on the downs is 35 acres, but more than half the total area of farm land is enclosed in fields larger than this. Table 5 shows the number of paddocks according to their size.

TABLE 5—SIZE OF PADDOCKS

Size group acres	Number of paddocks	Per cent. of paddocks
Under 20	587	37
20 and under 40 ..	613	38
40 and under 60 ..	266	16
60 and over	152	9
	1,618	100

As farm size increases fields tend to be larger. In Group A the average size is under 20 acres, in Group B 30 acres, and in Group C about 40 acres. High-producing farms have better subdivision, thus facilitating the control of pasture growth, than low-producing farms.

Ewe hoggets grazing on swedes grown with chou moellier. Provision of adequate winter fodder crops is essential on the downlands, where winters are severe.

Sheep Management

South Otago is well known for the high quality of its Romney ewes. A few farmers concentrate on breeding stud sheep, and on some other farms there are small Romney or Southdown studs. On most farms part of the ewe flock is mated to Romney rams to obtain ewe lamb replacements for the breeding flock and part is mated to fat lamb sires, mainly Southdowns, for fat lamb production.

In many instances 2-tooth ewes and old ewes are put to Southdown rams and the other ewes to Romney rams. As most farms are able to retain ewe lambs to replenish their ewe flocks, there is little buying-in of replacement ewes. The main purchases are rams, which are bought from the better flocks in the area, and store lambs for fattening. Stock sold includes fat lambs, some store lambs, cast-for-age ewes, ewe hoggets, 2-tooth ewes, and wethers.

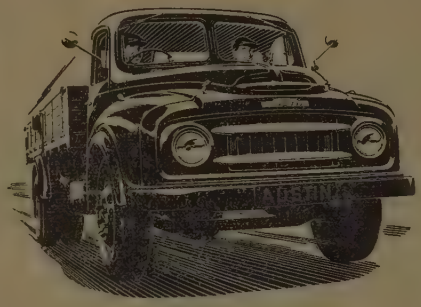
South and West Otago are healthy districts for sheep, though foot-rot is troublesome in wet seasons. Stock losses are mainly from sleepy sickness in ewes and pulpy kidney and blackleg in lambs and hoggets. Vaccination for pulpy kidney and blackleg is done on many farms and is more common on the high-producing farms than on the low-producing farms. Drenching of lambs at weaning to reduce worm infestation is general practice and on the better-managed farms lambs are drenched a second time before they are put on turnips.

Flushing of Ewes

The flushing of ewes on good fresh pasture or greenfeed for 2 to 3 weeks before tupping is a feature of management on more than half the farms. Generally the winter diet of the ewes comprises swedes and hay and a run-off on winter pastures. Great reliance is placed on swedes for winter feeding and little greenfeed is grown for the late winter period.

About 10 days before lambing starts the ewes are removed from the swedes to go on to good pasture to lamb. Then they are set stocked on pastures, according to the size of the particular fields, from lambing in September until weaning in January or February. The ewes are then restricted in their grazing in autumn to prevent them from getting too fat.

The lambs to be fattened are placed on rape or saved pasture and the ewe



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lambs to be retained are put on good pasture such as hay aftermath. The ewe lambs are treated well and a start is made with supplementary feeding in late autumn with hay and turnips and chaff. This continues through winter and until early spring, when the hoggets go on to young pasture.

Size of Ewe Flocks

The average size of breeding flocks of 2-tooth and older ewes is 820, half the flocks being larger than this and half smaller. The various sizes of flocks are shown in Table 6.

TABLE 6—SIZES OF BREEDING EWE FLOCKS IN 1952

Size of flocks	No. of farms
Under 500 ewes	11
500 and under 700	27
700 and under 900	23
900 and under 1,100	17
1,100 and under 1,300	13
1,300 and over	9
Total	100

A feature of the survey is that on most of the farms stock numbers increased during 1952 and few farms showed a drop. This expansion marks a progressive agricultural economy.

The numbers of stock wintered on the average farm for each size group of farm are shown in Table 7.

TABLE 7—AVERAGE NUMBER OF STOCK WINTERED PER FARM IN 1952 ON THREE GROUPS OF FARMS

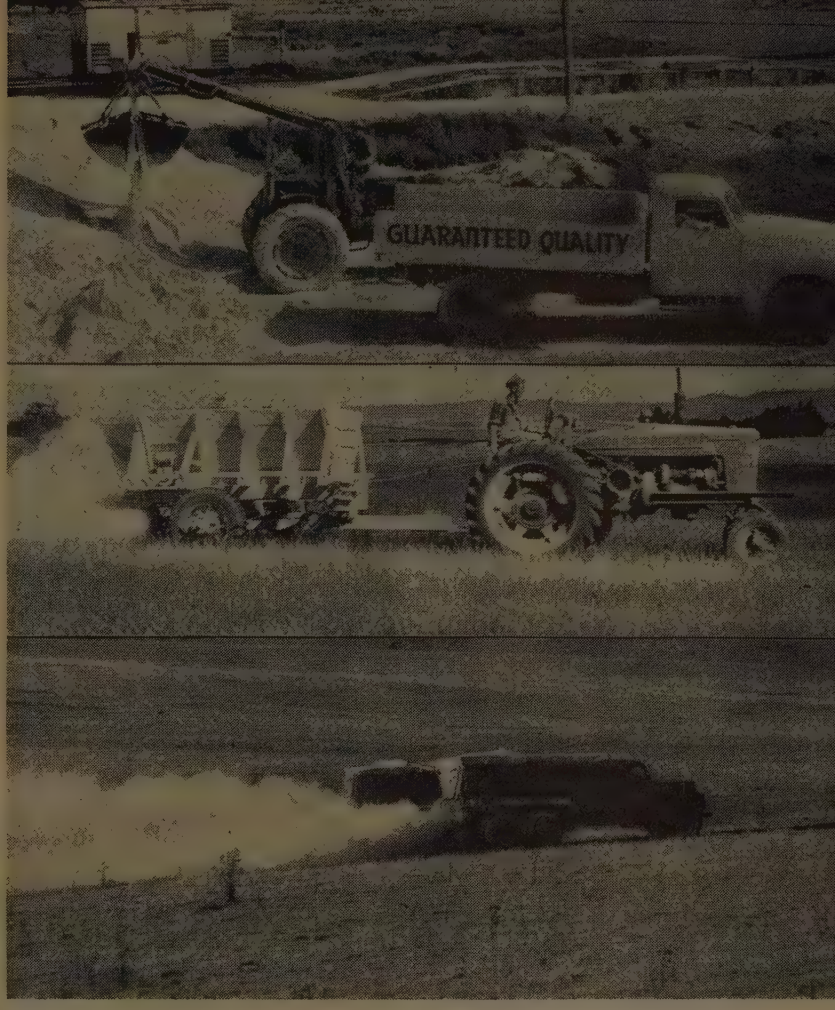
Class of stock	Farm group A (under 400 acres)	Farm group B (400 and under 700 acres)	Farm group C (over 700 acres)
Breeding ewes	527	870	1,112
Ewe hoggets	185	295	406
Other dry sheep	28	56	125
Cows and heifers	4	8	8
Other cattle	5	7	21
Horses	1	1	1

Table 7 shows the predominance of sheep farming in the area and the small part played by beef cattle. If all stock on the farms are converted to the standard "ewe equivalents", the stock-carrying capacities are 2.4 ewe equivalents per acre for Group A, 2.3 for Group B, and 1.9 for Group C.

Because in summer parts of farms are used for cereal and fattening crops and some pastures are closed to grazing for seed or hay crops, the pasture area available for grazing is less than in winter. In summer the large increase in stock carried comes with the lamb crop and only a little from the purchase of cattle and ewe hoggets. In terms of ewe equivalents summer stocking is on the average 30 per cent. higher than winter stocking; in Groups A and B the figure is 31 per cent. and in Group C 27 per cent. The stock carried on each acre of summer grazing averages 4.2 ewe equivalents in Group A, 4 in Group B, and 3.1 in Group C.

Lamb Production

The lambing percentage in the 1951-52 season was below average, owing to a shortage of feed in the preceding autumn, when little flushing of ewes was possible. Lambing percentage tends to fall as the size of flock increases. In Group A the average lambing percentage is 109, in Group B 102, and in Group C 96. This to some extent reflects the care of the ewe flock, in which the smaller farms have an advantage. The number of ewes per man averages 453 in Group A, 470 in Group B, and 558 in Group C.



Lime has played a major role in the development of the downlands. Upper—Stock pile at Wairuna siding. Bulk handling has become an important phase of lime distribution. Middle—Farmer spreading lime by tractor-drawn sower. Lower—Most of the lime is applied by contractors with bulk-spreading machines.

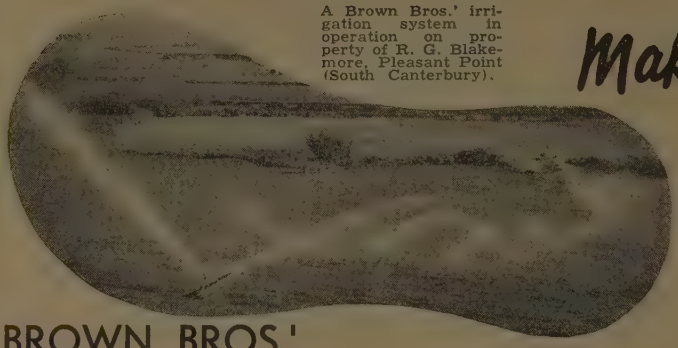
As farms increase in size their efficiency in lamb production tends to fall. This is true of the percentage of lambs drafted fat off the mothers and the lamb meat produced per acre. Details are set out in Table 8.

Factors in High Production of Fat Lambs

From a close study of many farms in the survey some useful information

TABLE 8—AVERAGE PERCENTAGE OF LAMBS DRAFTED FAT OFF THE MOTHERS AND AVERAGE WEIGHT OF DRESSED LAMB MEAT PER ACRE OF FARM LAND FOR THREE SIZE GROUPS OF FARMS

Size group acres	Average per cent. of lambs drafted fat off the mothers	Average weight of dressed lamb drafted fat off mothers	Average weight of lamb meat per acre
		lb.	lb.
Under 400	18	37.8	46
400 and under 700	16	37.6	41
700 and over	13	36.6	25



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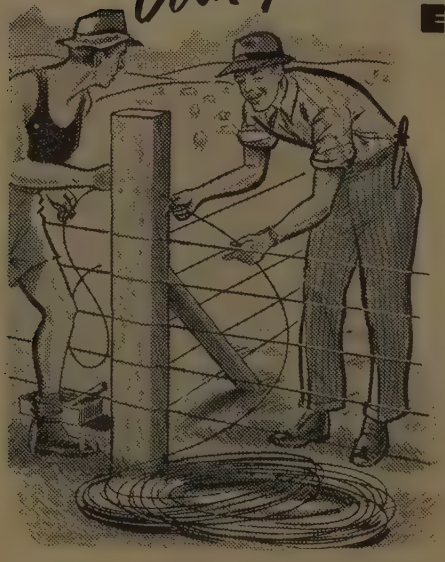

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is available on the production of fat lambs. For a start the quality of the ewes and rams has a bearing on production.

A comparison of two groups of farms, one with a high production of lamb meat per acre and the other with a low production, highlights many differences in farm management and production. The degree of farm improvement is important for production, as the high group farms have 82 per cent. of their land improved, compared with 59 per cent. in the low group. The value of good young pastures may be gauged from the fact that 54 per cent. of the total grazing of the high group is pasture under 6 years old, against 36 per cent. in the low group. Further, in the better group 31 per cent. of the total grazing is topdressed annually with phosphatic fertiliser, against 22 per cent. for the other farms, and there is a similar difference in the application of lime.

Though there is only slightly more deliberate flushing of the ewes in the high group, its better pastures assist. For winter feeding of the ewe flock 3.6 acres of turnips and swedes are grown for every 100 ewes in the high group, compared with 6.2 acres in the low group, which suggests that more reliance is placed on this crop as the staple winter diet on the low-meat-producing farms. When ewes are on turnips more provision is made in the high group for a run-off to good pasture and for the feeding of hay. In the high group also the ewes with twin lambs are separated out in spring for special treatment, which includes grazing on the best feed available.

In the group of high-meat-producing farms greater use is made of feed crops for fattening lambs, some fine crops of ridged rape particularly being grown on some of these farms. Some farmers ridge a few acres of rape in November for lamb-fattening feed, but later sowings of rape are generally made with the pasture mixture.

Buying in of store lambs for fattening is common on these farms; for every lamb bought for fattening on the low-meat-producing farms 26 are purchased for high-group farms. On the low-producing farms one lamb of every four lambs put on feed fails to fatten and has to be sold as a store lamb. As there is a lower lambing percentage in the low-meat-producing group, a greater proportion of ewe lambs tailed has to be retained for replacements for the ewe flock, thereby reducing the sales of fat lambs.

Manurial response (right) resulting from one application of 3cwt. per acre of molybdenised superphosphate to a run-out browntop sward at Kaihiku which contained extremely poor, stunted white clover.

All the various factors of farm management associated with high lamb production already mentioned contribute to the differences in productivity and financial returns between the two groups given in Table 9.

TABLE 9—COMPARISON OF FAT LAMB PRODUCTION OF TWO GROUPS OF FARMS WITH HIGH AND LOW PRODUCTION

	High group	Low group
Number of farms in group ..	19	10
Average size of farms in group (acres)	440	470
Size range of farms (acres)	269-789	286-722
Lambing percentage	113	94
Percentage of lambs drafted fat off ewes	36	7
Average dressed weight of fat lambs (lb.)	40.7	37.3
Lamb meat produced per acre of farm (lb.)	92	16
Gross income per farm (£) ..	6,045	2,802
Gross income from fat lambs per farm (£)	2,637	510
Percentage of gross income from fat lambs	44	18
Owner surplus per farm (£)	1,781	300

Wool Production

As with carrying capacity the amount of wool produced per acre tends to fall as farms increase in size. The average wool produced per acre is 21lb. in Group A, 20lb. in Group B, and 17lb. in Group C. Production of crossbred wool of 46 to 48 count is the popular aim.

Grazing of Cattle

Cattle play a small part on most farms of the downlands at present (see Table 7) and the few farms that carry a number of cattle show a low ratio of one beast to 25 to 30 sheep. On these downland farms cattle are complementary to the main enterprise of sheep farming and are used for controlling rank pasture growth and cleaning out gullies and creek beds. On the downs the present low cattle numbers reflect inadequate conservation of water, especially on the drier soils.

Labour on Farms

Generally there is one man, the owner-occupier, on farms under 400 acres in Group A, and on the larger farms there are usually two men, the owner and either a son or other adult employee. Table 10 shows the number of farms without labour assistance and those with sons and other employees.

That there are 4 farms in Group C of 23 large farms without labour assistance and a further 17 in Group B of 44 farms reflects the shortage of suitable farm labour. Production on large farms with no labour assistance is not high when compared with that of those with labour.

To assist the owner-operators on 97 farms there are only 60 permanent employees, of whom 5 are employed on some of the 30 farms under 400 acres.

TABLE 10—FARM LABOUR ON FARMS IN THREE SIZE GROUPS

Farm size group (acres)	Farms employing no labour	*Farms employing family labour	Farms with employees other than family labour	Total
A. Under 400	25	4	1	30
B. 400 and under 700 ..	17	12	15	44
C. 700 and over	4	7	12	23

* On a few of these farms other permanent men are employed.

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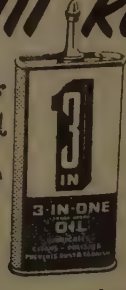

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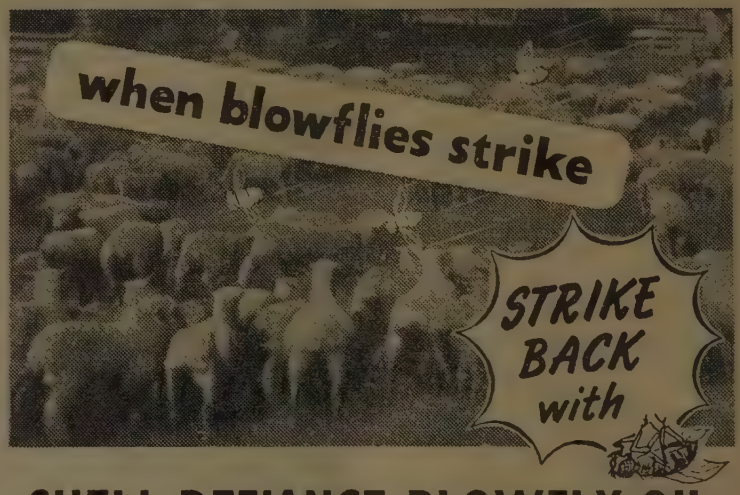

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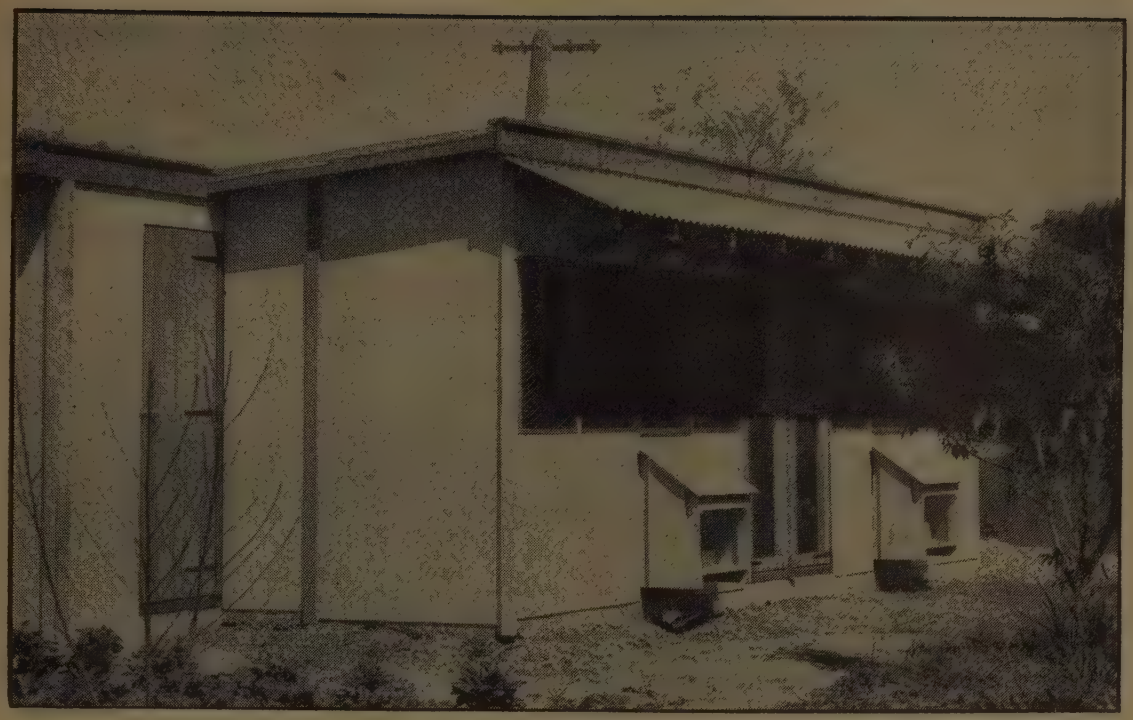


Management of Litter in a Household Poultry House

MOST household poultry keepers appreciate the necessity for litter in their poultry houses, but not so many know what materials may be used and the best method of managing litter in a laying shed. In this article the Animal Industry Division offers advice on the management of litter which may have a good effect on egg production, particularly during winter.

CONCRETE floors are the most popular type used in laying houses throughout the country. A properly surfaced concrete floor can be cleaned and disinfected efficiently when the shed is cleaned out. This gives increased control over the spread of disease.

Two important factors are often overlooked by the householder putting down a concrete floor for a laying shed. It is of great importance that the top of the floor should be well above ground level outside, say a minimum of 6in., and furthermore it is advisable to build up a thick core of rubble, stones, or other coarse material before the floor is put down. A dry floor is one of the first essentials in the maintenance of dry litter. A concrete floor which is below the surface of the surrounding ground is likely to become damp, particularly during the heavy rains of winter. Moisture tends to rise, but only if it has a close-textured material to creep up by capillary action. If broken bricks or stones form the base on which the concrete floor is built, the rising of moisture from the earth is reduced to a minimum, owing to the comparatively large gaps between the bricks or stones of the foundation of the floor.

Earthen floors can be used quite successfully, but they are more difficult to clean and disinfect between laying seasons and some of the earth must be removed with the litter. This lowers the level of the floor year after year until it becomes essential to refill with fresh earth. When an outbreak of disease occurs prevention of its

Reminders for February

THIS season's pullets should not be placed in a laying shed until it has been thoroughly cleaned and disinfected. After cleaning has been done the floor should be covered to a depth of 4in. to 6in. with clean litter comprising straw, wood shavings, or similar material.

As a precaution against roundworm it is advisable to dose pullets before they come into production with carbon tetrachloride capsules. Each bird over 16 weeks of age should be given a 2 c.c. carbon tetrachloride capsule.

Birds coming into production should receive No. 1 laying mash or pellets. If No. 2 laying mash is fed, 1lb. of meat meal should be added to every 10lb. of mash. Birds should have adequate supplies of lime and hard, flint grit at all times.

As last season's birds begin moulting they should be culled and used for table purposes. If any of the older birds are required for another laying season, the ones to retain are those which are last to moult.

spread from the affected flock to that kept in the subsequent year is also more difficult with an earthen floor. Some local authorities specify a concrete floor for poultry sheds in residential areas.

Why Litter is Necessary

An average laying bird produces about 42lb. of droppings per year and fresh droppings contain between 50 and 60 per cent. of water. Where birds are kept permanently in a laying shed (and this is strongly recommended for household poultry keepers with limited garden space) something must be provided to contain these droppings and to absorb the moisture if reasonably hygienic conditions are to be maintained. Furthermore birds delight in scratching and dust bathing in broken-down litter. Both practices are conducive to maintaining the birds' health, and litter on the floor of a laying shed is therefore essential for efficient and sanitary management.

Type of Litter

Many household poultry keepers think in terms of straw for their laying sheds and straw is commonly used by commercial producers in all areas. Straw in some areas is becoming difficult to obtain and is rising in price. Fortunately straw is not the only material suitable for laying sheds; in fact it is doubtful if it is the most efficient type of litter. Both wood shavings and sawdust may be used successfully.

Frequently doubt is expressed about the use of sawdust, the comment being made that the birds eat the sawdust, with detriment to their digestive system. This is not so under normal circumstances. **Healthy** birds will not eat sufficient sawdust to affect them adversely. In Great Britain and in New Zealand sawdust is being used for laying birds successfully and is an excellent form of litter. On the other hand where birds are unhealthy, suffering perhaps from internal parasites such as worms or coccidia, they may develop what is termed a depraved appetite, when they will eat any coarse, fibrous material such as straw, shavings, or sawdust.

Household poultry keepers may therefore use with confidence straw, wood shavings, or sawdust according to which of these materials is readily available in their district and can be obtained at a reasonable or low cost. Some of the best results are obtained by mixing these materials. Straw and shavings make a most efficient litter for laying birds, as does also a base of sawdust covered with shavings.

Some fear has been expressed regarding the use of shavings or sawdust from timber that has been treated against borer. At the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, chickens were run on sawdust from treated timber and some of the sawdust became mixed in with the dry mash fed. There were no undue losses.

How Much Litter Should be Used?

Many householders use too little litter in their laying sheds. What appears to be an ample amount is placed in the shed when new season's pullets are introduced, but this gradually breaks down and absorbs droppings and moisture. Later the amount of litter is inadequate. It should be added to before it becomes damp and dirty.

Management of Litter

If litter is to be used successfully, a good bed of it must be built up in autumn. Litter, particularly straw, should not be cleaned out in winter unless this becomes absolutely necessary. A good bed of straw 6in. deep established in early autumn will break down as the birds scratch in it and ultimately become about 4in. of material. If it becomes less, more straw should be added.

Once established in this way and broken up, straw is less likely to become damp during winter if it is on a dry floor. If a floor is cleaned out during winter and fresh straw put down, the litter is most likely to become damp and will mat down into an unsatisfactory condition. This is less likely to happen with sawdust and shavings, as these are more absorbent than long straw. Excessively damp litter in winter is liable to cause an outbreak of colds among the birds and will rapidly lower egg production.

How Often Should Litter be Cleaned out?

There is a tendency to think that litter on the floor of a laying shed should be cleaned out regularly throughout the year. Litter will break down and often appear dirty, but if it is friable and dry, it need not be removed. It should be stirred up with a fork regularly and kept evenly distributed. When birds are fed grain in the litter they will invariably face the light coming in at the front of the shed and will scratch the litter toward the back of the shed. It should be raked forward regularly.

The condition of litter and its length of life will depend to a marked extent on the number of birds kept in the laying house. Where birds are maintained inside the house at all times (intensive system) 4½ sq. ft. of floor space per bird is necessary. If less space is given, trouble in maintaining dry litter may be expected. Obviously if there is overcrowding, there is an increased concentration of droppings and moisture in the litter.

Litter becoming infested with fleas should be sprinkled with a 10 per cent. DDT powder.

Career Prospects for Extension Workers in Agriculture

As more research stations are established and further scientific discoveries are made there is greater need for more extension workers in agriculture. Farmers themselves are appreciating more and more the benefits to be secured from the application of scientific methods and improved practices, so there is a greater demand for the services of the farm advisory officer, not only the general practitioner but the specialist in such fields as drainage and irrigation.

Thus there are increasing opportunities for young men who have a desire to follow an interesting outdoor occupation, who have an interest in science, and who have an urge to become leaders in New Zealand's greatest industry—farming.

Agricultural extension work involves visiting farms and talking to farmers, observing closely the methods used under different soil and climatic conditions, and keeping close touch with the results of research work and modifying them to suit local requirements.

To qualify for work of this nature it is desirable for an applicant to obtain a degree in agricultural science at either Massey or Canterbury Agricultural College. Subsequently general experience is obtained in carrying out some of the general functions of the Department of Agriculture, such as seed certification or experimental work. The instructor is then equipped to embark on the more responsible task of farm advisory work.

Those young men who desire to enter this profession, which offers a life of interest, variety, and, because it concerns increased food production, much satisfaction to the individual, should pass the university entrance examination and study for the intermediate examination at one of the four university colleges. Subsequently candidates spend 3 years at either Massey or Canterbury Agricultural College to take the B.Agr.Sc. degree.

Details of careers which can be followed in agriculture are obtainable from the nearest office of the Department of Agriculture or from the Staff Training Officer, P.O. Box 2298, Wellington.

Moving a Bee Colony

Seasonal Notes for the Domestic Beekeeper

BEES locate their particular hive by its relation to surrounding features, and movement of a colony from one site to another can result in loss of bees and such a reduction in strength of the hive that the gathering of a profitable honey crop is impossible. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses the moving or transference of a bee colony with the least disruption of the bees and effect on the honey crop.

THOUGH the movement of bee colonies from one apiary site to another is often carried out by commercial beekeepers, usually in early spring, which is the best time to move bees, certain fundamental precautions are always observed when these movements are undertaken. Regard to the particular sense by which the flying bees of a colony return to the exact site of the hive after each flight must always be exercised if the hive is to be moved to another location without undue loss of bees.

The development of the sense of location in the honey bee normally begins about 8 to 10 days after emergence as an adult bee. Up to this time the young bee is engaged in various duties within the hive, and unless the colony is unduly disturbed or the population becomes unbalanced with an excess of young bees or a grave lack of older field bees, the young bee will not leave the hive.

Orientation or Play Flights

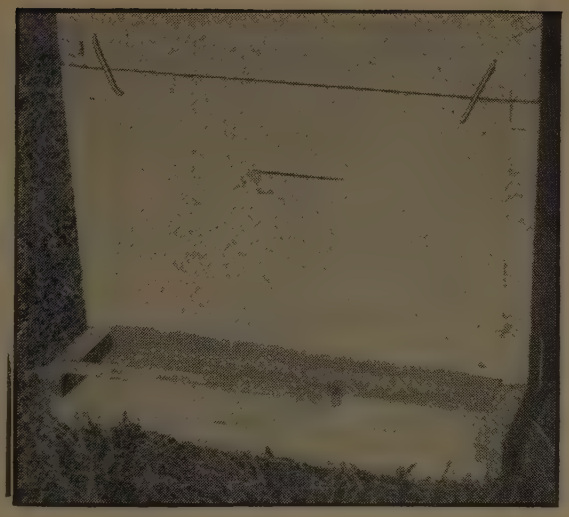
At 8 to 10 days of age the bee begins to make short flights in front of the hive and in its immediate vicinity. The range and duration of the flights are increased on each occasion, but do not at first last for more than a few minutes. During these flights, which are known as orientation or play flights, the bees fly in ever-increasing circles until the whole working range of the colony is covered. Each time the bees familiarise themselves with objects which serve to locate the home. Once the exact location is firmly fixed in the bees' senses they will go back and forth in all directions for 1 to 2 miles or more from the hive without making any further apparent note of distinguishing objects. These flights lead to the change from the indoor duties within the colony to those of the field, an event which occurs when the bee is approaching 3 weeks of age.

This deeply ingrained sense of location is responsible for the apparent confusion of bees which arises when a hive is moved only a short distance. The flying bees of a colony have familiarised themselves with the whole range within a mile or more from the hive, and because it is the **location** and not the **hive** which is fixed in their memory, any shifting of the hive within this range will result in the flying bees on their next flight finding themselves in familiar territory. They will then automatically return to the previous location of the hive to become lost and die. If bees are moved distances of 2 miles or more, they will soon reorient themselves to the new location and the loss of bees experienced with shorter moves does not occur.

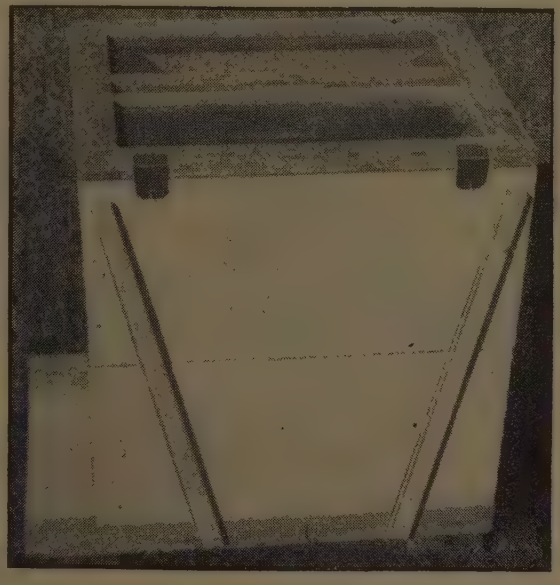
Domestic beekeepers with only one permanent apiary site available may sometimes need for their own convenience or that of neighbours or passers-by in built-up areas to move a hive only a short distance. The best method then is to try to secure a temporary site not less than 2 miles away, move the bees to this, leave them for at least 2 weeks, and then return them to the new position. The bees will reorient themselves at each move and there will be little loss of bees.

If this is not feasible, it may be possible to place the hive in its new position by a series of very short daily moves. The first two or three moves should not be of more than 1ft. each time in the desired direction. The distance of subsequent moves can be increased very slightly each day, but the increase should not be more than a few inches daily. Bees moved in this way will learn to expect a change in location and will find the hive with little trouble.

Where the disposition of trees, hedges, or buildings on the property prevents this type of movement the



Hive ready for removal, with wire gauze entrance screen in place and securely fastened by hive staples.



Hive ready for long distance removal, with top ventilation screen in place. Slats nailed two on each side and one diagonally across the back hold supers and bottom board securely together.

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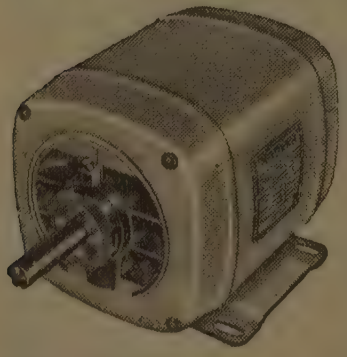

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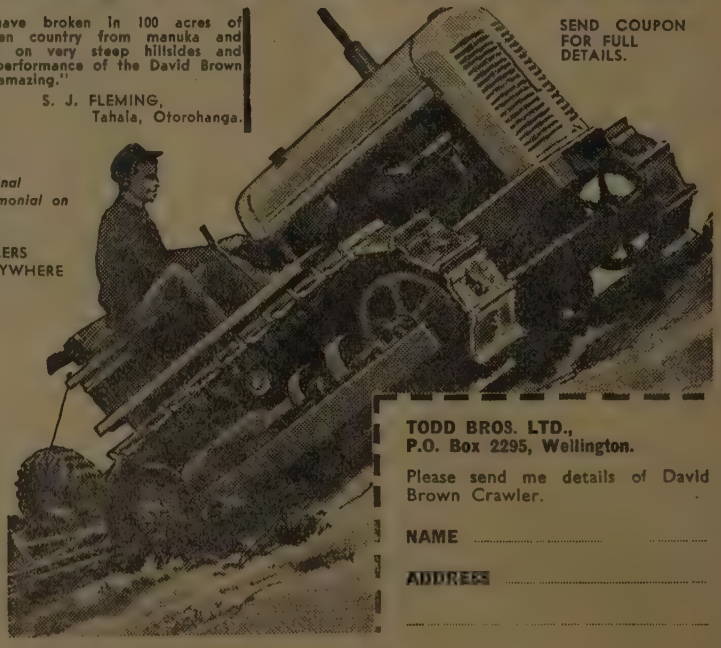

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hive can be moved by closing the entrance in the evening with wire gauze and moving the hive directly to the new position. The wire gauze is left in place until the following morning, when it is removed quietly. When the gauze is removed the entrance should be reduced to a space of 2in. to 3in. and some leafy branches pushed into the ground so that a screen is formed immediately in front of the entrance. This will cause some of the bees to relocate. However, many will still return to the old site. To secure these a frame of brood should be placed in a hive on the old location. When the bees have clustered on this the following evening it can be removed and the bees reunited to the parent hive through a sheet of newspaper. In addition to the screen of branches a length of board or a sheet of glass leant on an angle against the entrance of the hive will further arrest the attention of the bees and tend to cause relocation.

Though the movement of bees is best carried out in early spring, when colony strength and brood rearing are at a minimum, the methods described will be found effective throughout the year except during periods of a major honey flow. Attempts to move bees short distances during heavy honey flows will usually cause them to become thoroughly disorganised and particularly vicious. If relocation of a colony during a major honey flow becomes necessary, only the method first described should be adopted.

Preparing Hives for Removal

Where the movement is of only 1ft. or so at a time no preparation of the hive is needed other than to see that the bottom board is sound and will bear the weight of the hive when it is lifted. At dusk, when all the flying bees have returned, the hive should be picked up quietly and placed gently in the new position. If bees are clustered on the alighting board or the front of the hive, a few light puffs of smoke should be given, when they will retreat into the hive.

When the entrance of a hive has to be closed as suggested in the third method a piece of wire gauze of a gauge similar to that used for fly screens should be cut to a length which will fit neatly across the entrance. It should be about 6in. wide so that in application it can be bent into a narrow V shape. The gauze is then pushed into the entrance with the narrow, closed part of the V innermost. Two tacks at top and bottom will then hold it securely in place.

If a hive is moved more than a few yards, it must be firmly fastened together and no openings must be left between hive parts through which the bees could escape. Bottom boards must be securely fastened to the super. Hive or crate staples, which are procurable from most suppliers of hive equipment, are excellent for this purpose. If these are not obtainable, strips of wood can be nailed diagonally from the outer edge of the bottom board to the supers. There should be a strip on each side and one at the back. Where more than one hive body is in use the bodies must be stapled together or the strips of wood continued upward to the top of the upper super. This preparation is best done the day previous to moving.

Bees closed up for moving must have ample ventilation. When hives are to be moved in warm weather particular care has to be taken to ensure that good ventilation is provided. If the colony is strong in bees and occupies more than one super, it is advisable to construct a wire gauze screen to cover the hive in place of the usual lid or roof. This will allow the free movement of air through the hive. The screen is simply constructed by making a framework of 2in. x 1in. timber of the same dimensions as the upper super. This is covered with wire gauze of the same size as that recommended for closing the entrance. A hive with the entrance closed with wire gauze and fitted with a top screen will survive a great deal of travelling, provided it is not unduly exposed to hot sunshine and ventilation is not allowed to become restricted by outside means.

Where a hive is being transported by a motor vehicle with an open body the hive should be placed with its entrance facing the direction of travel. If the journey is made in sunny weather and is to be of more than a few minutes some form of shelter from the sun should be provided. Beekeepers moving hives in private motor cars may find that one or two hives can be carried conveniently in the luggage boot. If hives are transported in this way the lid of the boot should not be closed. With many modern cars the boot is made practically airtight to exclude dust. Hives carried in a luggage boot with the lid closed are likely to overheat and suffocate within a very short time.

If the hive is to be moved a long distance, as from one town to another, and rail or other forms of public transport must be used, very great care should be taken to see that the hive is securely fastened and that it is well labelled with clearly written instructions as to stowage and provision of ventilation. If possible, the persons responsible for stowage should be approached and the requirements for safe transport explained to them.

It should be remembered, too, that where a hive is to be moved to a new site on another property the new site must be registered with the Department of Agriculture and a permit for removal obtained (for disease control purposes) **before** the transfer is made. Applications for registration and permits should be made direct to the local Apiary Instructor in the district.

MOVING A BEE COLONY

[*Green and Hahn*

Bees entering prepared standard hive after being dumped from box hive.

MOVING A BEE COLONY . . .

Transferring Bees

Though the term transferring may be thought to be synonymous with moving, it is used technically to indicate the transfer of a colony of bees from a box or other irregular shelter into a proper movable-frame hive. In New Zealand under the provisions of the Apiaries Act all colonies of bees must be kept in hives fitted with proper movable combs. Beekeepers may thus find themselves faced with the problem of transferring a colony which has become thoroughly established in other than a regulation hive.

Transferring bees into proper hives is best done when a honey flow is in progress, particularly if drawn combs are not available for the transfer. If only frames of foundation are used, the work should be done during or immediately before a honey flow, as otherwise the bees will have to be fed heavily with honey or sugar syrup.

In New Zealand, where bees are easily raised, the work and time involved in transferring bees from hollow trees or walls of buildings is not usually justified. Unless for purposes of disease control or other reasons they must be removed entirely with combs and honey, it is better to destroy them in place. The local Apiary Instructor of the Department of Agriculture will be able to advise on the most suitable means of destruction. Bees in boxes or containers which can be handled can be transferred in the following manner.

First see that the usual protective clothing and veil are properly adjusted. Then have the smoker functioning well and producing a good volume of smoke. Give the colony a few good puffs of smoke, turn the container upside down, and remove the bottom of the container or at least make a hole in it not less than 6in. across. On top of this stand a super of drawn combs or wax foundation. Place a lid on the super and carefully close any openings other than the 6in. hole between the super and the original container so that the bees can move upward and go only through the opening between the two. Then with a light hammer or a stick in each hand beat continuously on the sides of the original container. This beating should be continued for some time until the bees have moved up into the new super. Bees do not always move immediately and may take up to half an hour. The giving of occasional puffs of smoke into the container will help to cause the bees to pass upward.

When the bees have moved up into the new super a queen excluder is placed between the two. The entrance of the original container is closed and an entrance to the super provided above the excluder. The brood left in the old container will all have emerged in 21 days and the colony will have established itself in the upper super. At the end of this period the upper super is placed on a floor board immediately alongside the original stand, the excluder is removed, and any bees remaining in the old container are shaken in front of the new hive. The old combs, any remaining honey, and the container can then be disposed of as desired. If any doubt exists as to the health of the colony in the old container, the combs, honey, and the container should be burnt immediately and the residue buried.

Variation of Method

Should a queen excluder not be available, the method may be varied as follows: Proceed as described previously until the bulk of the bees have entered the new super. Then immediately stand this on a floor board alongside the original stand. Raise the front of the super 2in. or 3in. on wooden blocks and spread several sheets of newspaper in front so that any bees dumped there have an uninterrupted passage into the hive. Then take the original container and dump any remaining bees on to the newspaper, from which they will move into the new home. The old combs and the container are then taken away.

The importance of ensuring that colonies of bees taken in this manner are free of disease cannot be over-emphasised. Any dumping or shaking of boxes or other containers holding combs and honey should always be done over sheets of newspaper so that if any infected honey should be spilt it can be quickly gathered up and burnt.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:—

NORTH ISLAND

February

1 February—Marton A. and P. at Marton.
3 and 4 February—Rodney A. and P. at Warkworth.
4 February—Rangitikei A. and P. at Taihape.
4 February—Woodville A. and P. at Woodville.
7 and 8 February—Dannevirke District A. and P. at Dannevirke.
10 February—Dannevirke Ram Fair at Dannevirke.
10 and 11 February—Taumarunui and District A. and P. at Taumarunui.
10 and 11 February—Taranaki A. and P. at New Plymouth.
11 February—Hukerenui A. and P. at Hukerenui.
11 February—Pahiatua A. and P. at Pahiatua.
*11 February—Galatea A. and P. at Galatea.
11 February—Waiwera A. and P. at Waiwera.
15 February—Te Awamutu A., P., and H. at Te Awamutu.
17 and 18 February—Ohura A., P., H., and I. at Nihoniho.
17 and 18 February—Franklin A. and P. at Pukekohe.
17 and 18 February—Masterton A. and P. at Masterton.
18 February—Northern Wairoa A. and P. at Mititai.
*18 February—Tauranga A. and P. at Tauranga.
*21 February—Otorohanga A. and P. at Otorohanga.
23 February—Matamata A. and P. at Matamata.
24 and 25 February—Wellington and Hutt Valley A. and P. at Trentham.
24 and 25 February—Te Kuiti and District A. and P. at Te Kuiti.
25 February—Te Puke A. and P. at Paengaroa.
25 February—Putaruru District A. and P. at Putaruru.

March

*3 March—Whakatane A. and P. at Whakatane.
3 March—Waiotira Junction A. and P. at Waiotira.
3 March—Mangonui County A. and P. at Kaitaia.
3 March—Albany A. and P. at Albany.
3 March—Waikato Central A. and P. at Cambridge.
*7 March—Morrinsville A. and P. at Morrinsville.
7 March—Opotiki A. and P. at Opotiki.
10 March—Kumeu District A. and H. at Kumeu.
10 March—Hawke's Bay A. and P. at Hastings.
*17 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

February

2 and 3 February—Otago A. and P. at Dunedin.
11 February—Golden Bay A. and P. at Takaka.
*11 February—Inangahua A. and P. at Reefton.
18 February—Banks Peninsula A. and P. at Little River.
18 February—Murchison A. and P. at Murchison.
*18 February—Central Otago A. and P. at Omakau.
24 and 25 February—Buller A. and P. at Westport.
*25 February—Kaikoura A. and P. at Kaikoura.
25 February—Manlototo A. and P. at Ranfurly.

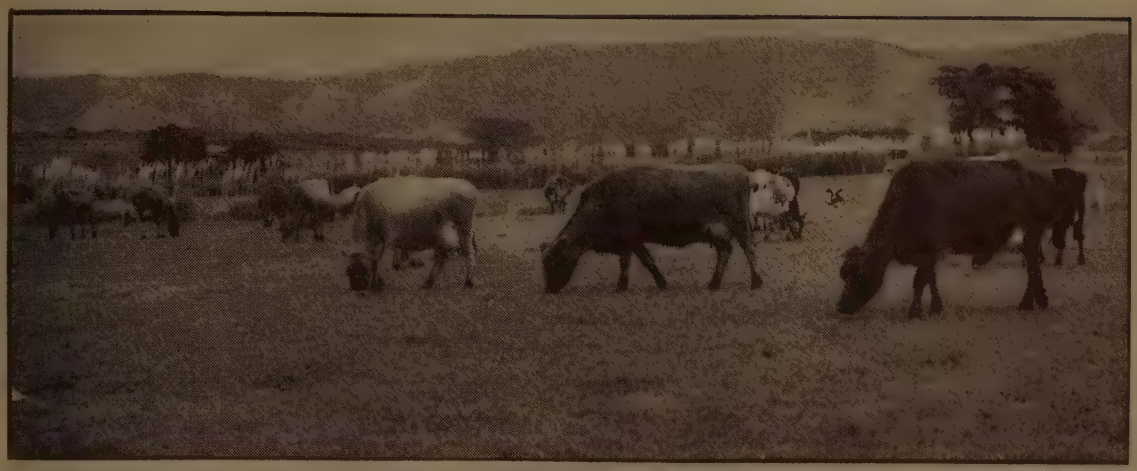
March

3 March—Amuri A. and P. at Rotherham.
3 March—Temuka and Geraldine A. and P. at Winchester.
10 March—Cheviot A. and P. at Cheviot.
10 March—Mt. Benger A. and P. at Roxburgh.
*13 March—Lake County A. and P. at Arrowtown.
17 March—Hawarden A. and P. at Hawarden.
17 March—Mayfield A. and P. at Mayfield.
17 March—Upper Clutha A. and P. at Wanaka.
*24 March—Methven A. and P. at Methven.

April

2 April—Mackenzie County A. and P. at Fairlie.
2 April—Strath-Taieri A. and P. at Middlemarch.
7 April—Oxford A. and P. at Oxford.
14 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.



Meeting the Seasonal Feed Requirements of the Dairy Herd

By L. R. WALLACE,
Chief Nutrition Officer, Department of Agriculture's Ruakura Animal Research Station, Hamilton

(Adapted from a paper at the Ruakura Farmers' Conference 1955)

THE New Zealand dairy farmer relies almost entirely on pasture and its products hay and silage for feeding his herd. In this lies the economic strength of the industry, for in New Zealand these feedstuffs can be produced very cheaply—much more cheaply than can the feedstuffs on which most oversees competitors have to depend. But it is this reliance on pastures that gives rise to many of the nutritional problems which the New Zealand dairy farmer has to face.

SOME of the chief management problems in dairy farming in New Zealand are associated with fairly constant stock numbers but a variable feed supply.

Inflexible Nature of Herd Requirements

On most farms stock numbers are varied little from one year to the next and their feed requirements can be predicted with a high degree of accuracy. Thus, every animal in a herd needs a certain fixed quantity of feed per day to maintain each 100lb. of body-weight. It needs in addition a further set quantity for each pound of milk and butterfat produced and for each pound of body-weight gain. Some animals—those of high dairy merit—will continue to produce at a high level when underfed for short periods by drawing on their body reserves, but there is obviously a limit to this and, generally, feed requirements have to be fully and regularly provided or production suffers.

Variable Nature of Feed Production

Under a grassland farming system provision of adequate feed at all times is not easy. As farmers know only too well from recent experience, the volume of grass growth can vary enormously from year to year and from month to month within each dairying season.

Some grassland experts have claimed that modern high-producing strains of grasses and clovers give pastures whose growth is spread over the year in a pattern that fits quite closely the normal curve of dairy feed demands. Unfortunately, this has not been the experience at Ruakura. Even these improved pastures cannot be relied on to throw feed at the rate required by the herd.

Despite the fact that all cows are calved together in early spring to fit their demands to the feed supply, there is usually a superabundance of feed during October and November and an embarrassing shortage at other times, particularly during late winter and early spring and during the summer drought that commonly sets in after Christmas. In meeting the nutritional requirements of his herd, then, the major task of the New Zealand dairyman is still that of evening out the highly variable feed supply provided by his pastures.

Importance of Feed Quality

In evening out the feed supply attention must be paid to feed quality. It must be remembered, for instance, that some feeds such as hay, though useful for wintering dry stock, are comparatively valueless for milk production. Further, even pasture itself can vary enormously in quality. Thus, fresh, rapidly grown, leafy material with a high protein and low fibre content is a splendid milk-producing feed, whereas grass that has been allowed to run off to seed is low in protein, high in fibre, and cannot be expected to support a high level of milk production.

Fitting Feed Supply to Stock Needs

Most dairy farmers are thoroughly familiar with the techniques that can be used to even out feed supplies and keep pastures in a highly nutritious stage of growth. The more important of these are:—

1. Controlled grazing, which necessarily involves a planned farm layout, permanent subdivision into a minimum of 14 paddocks, and the use of the electric fence during critical periods. Without adequate subdivision it is impossible to adopt that system of alternate grazing and spelling of pastures which is essential to secure maximum pasture yields and to effect efficient utilisation at a leafy stage of growth.

2. The conservation of surplus spring growth in the form of silage and hay for use during the periods of feed shortage in summer and winter.

3. The spelling of a proportion of the pastures in autumn and early

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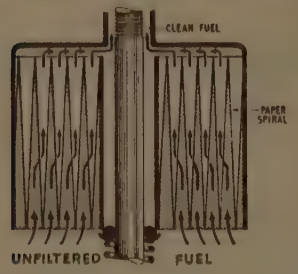

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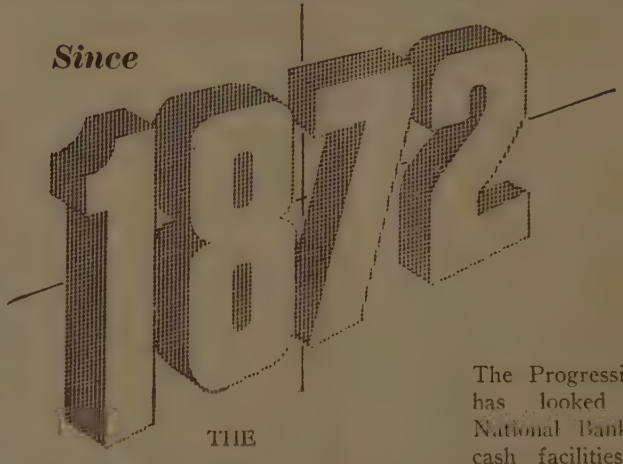

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There is no point in carrying over reserves of hay and silage if these are allowed to rot away before they are needed.

winter and the storage of this autumn-grown grass in situ for winter and early spring use.

4. The use of summer and winter crops and special-purpose pastures.

5. The application of phosphatic fertilisers in autumn to stimulate growth of pastures during autumn and winter.

6. The use of irrigation plant to fill the summer feed gap.

7. The use of purchased feeding stuffs.

Each of these techniques has its special usefulness. Some, such as controlled grazing, can be used profitably on all farms; others, such as irrigation, can be used only where conditions are suitable.

Need for Adequate Hay and Silage Reserves

The solution to the feed problems that arise from the highly variable amounts of feed grown from year to year obviously lies in the conservation of the surplus grass grown in good years as hay and silage to supplement the feed supply in poor years. All farmers know this, but only a minority apply their knowledge, the majority pursuing a hand-to-mouth policy which causes herd averages to fluctuate widely according to the type of season.

To achieve high butterfat production per acre a large amount of feed must be grown and this must be used efficiently. Efficient utilisation implies not only that a high proportion of the feed grown should be consumed, but that the feed eaten should be efficiently converted to butterfat within the animal.

To ensure that a high proportion of the feed grown is consumed a high stocking rate and carefully controlled grazing management are needed, and to obtain efficient conversion within the animal a reasonably high level of production per cow is essential. In practice it is difficult to achieve full utilisation of all feed grown and at the same time achieve maximum per-cow yields.

Usually there is much more to be gained by sacrificing a little in per-cow production to obtain the advantage of a high stocking rate and really efficient feed utilisation during average and better than average years. However, the higher the stocking rate is the greater will be the vulnerability of the farm to unfavourable weather and the more essential it will be to conserve adequate amounts of hay and silage and to carry over reasonable reserves from year to year to guard against serious loss of production in less growthy years.

There is, of course, no point in carrying over reserves of hay and silage if these are allowed to rot away before they are needed. This means that weather-proof hay barns must be provided. It means also that greater attention must be paid than at present to the provision of well-constructed silos. At Ruakura wastage in silage pits has been markedly reduced since these have been concreted.

Consider the case of a man making 20 acres of silage each year and suffering a 50 per cent. loss of dry matter in the process. He is putting in approximately 40 tons of dry matter and getting back only 20 tons in the form of usable silage. If he can cut his losses down to 40 per cent., he will get back an extra 4 tons of silage dry matter. In feeding value this is equivalent to at least 5 tons of average-quality hay, which at £8 a ton would be worth £40. Clearly, the saving effected over a few years would go a long way toward the cost of constructing really first-class silos.

The various practices that can be employed to maintain production throughout the year cannot be dealt with minutely here. The wintering problem will receive most attention.

Meeting Herd Requirements during Winter and Early Spring

There is now abundant experimental evidence available which clearly demonstrates that the level of feeding during winter, when cows are dry, is of considerable importance in determining the level of yield in the following lactation. Some examples follow.

At Ruakura during each of three successive seasons two groups of cows were matched as evenly as possible in respect to previous production records, calving dates, and body-weights. One group was extremely well fed on silage, hay, and autumn-saved pastures for approximately 3 months before calving; the other group was poorly fed on fairly bare pasture and limited quantities of hay over the same period. Each year the well-fed cattle gained in weight and calved in excellent condition, whereas the poorly fed lost weight and were very thin. The result was that the well-wintered cattle outproduced the poorly wintered by an average of 50lb. of butterfat per cow (Fig. 1).

In other trials of the same kind made both at Ruakura and at Massey Agricultural College similar results have been obtained. The size of the difference in butterfat production varied according to the extent of the differences in treatment, but in all cases the well-wintered cattle have given substantially higher yields. It should be emphasised that in all these trials the feeding treatment differences were confined entirely to the pre-calving period. In each case the well-wintered and poorly wintered cattle were run together as a single herd after calving and fed really well from then onward.

Feeding after Calving

The reason for the importance of condition at calving time will be more obvious when the period immediately

after calving has been considered. On many farms there is frequently an acute feed shortage during the first 6 to 8 weeks after calving before the rate of pasture growth increases sufficiently to cover feed requirements. To what extent does underfeeding at this time affect butterfat yields?

It is important to realise that at this stage even cows liberally fed on grass are not capable of eating sufficient to cover their full requirements. They can maintain production only by drawing on body reserves and in consequence there is usually a body-weight loss for the first 6 to 8 weeks after calving. The lower the level of feeding is the greater is this drain on body reserves and the greater is the body-weight loss after calving.

Fig. 2 shows what happened in an experiment carried out at Ruakura in which 22 sets of identical twins were used. Before calving all the cows were fed alike and they all calved in good condition. After calving all the twins were separated to form two groups. Both groups were break fed on autumn-saved pasture, but the size of the breaks was adjusted so that one

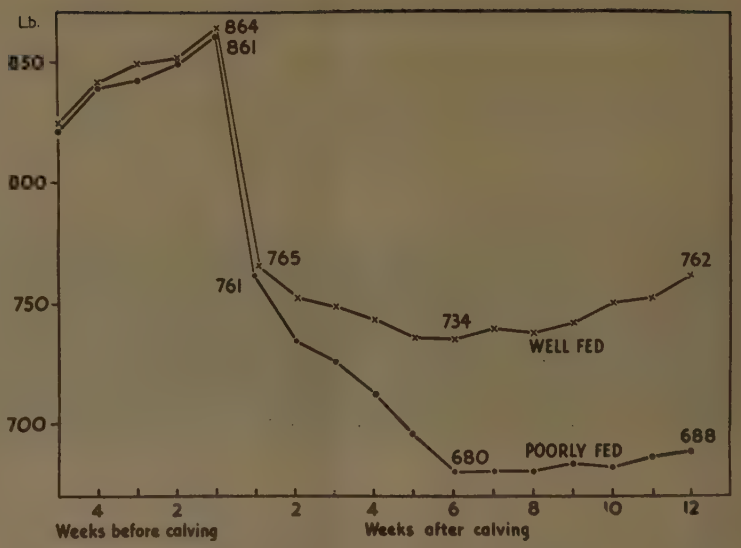

Fig. 2—Average body-weights of two groups of twins, one well fed and the other poorly fed after calving, but fed alike before calving.

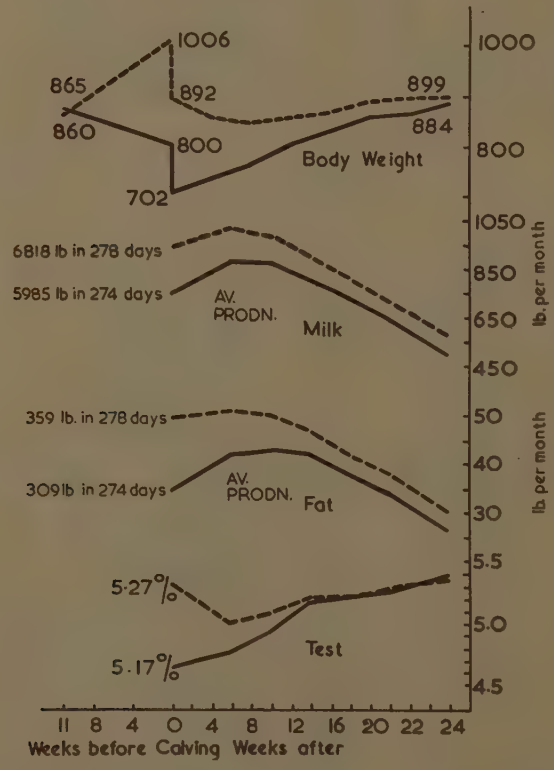

Fig. 1—Results from two groups of cows, one well fed (broken line) and the other poorly fed (unbroken line) before calving, but receiving the same feed after calving.

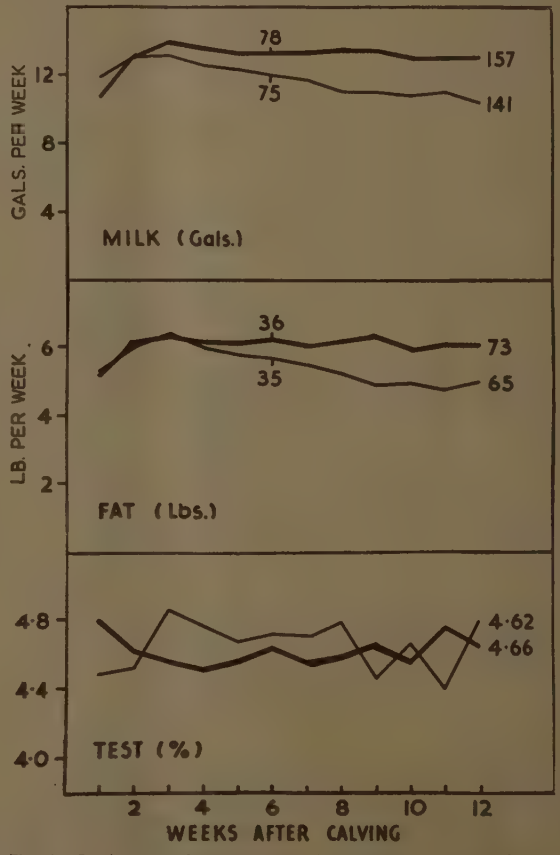

Fig. 3—Production of two groups of twins, one well fed (thick line) and the other poorly fed (thin line) after calving, but fed alike before calving.

group grazed only 60 per cent. of the area grazed by the other; one group was liberally fed whereas the intake of their mates was restricted.

Both groups lost body-weight, but not to the same extent, and by the end of the sixth week of lactation the poorly fed twins had lost 50lb. more weight than had their well-fed mates. Yet over this 6 weeks the production difference between the groups amounted to less than 1lb. of butterfat per cow. The poorly fed group were able to compensate for their lower level of feed intake by drawing heavily on body reserves, and though they produced less milk, they had the higher test.

However, from the sixth week of lactation the production of the poorly fed twins began to fall below that of their well-fed mates. By the twelfth week the well-fed group was producing 20 per cent. more butterfat than the poorly fed group.

There are two lessons to be learnt from this experiment: First, provided cows calve in good condition, they can stand a short period of moderate under-feeding after calving without loss of production; secondly, if this period of under-feeding is prolonged beyond a certain point, production will suffer. Cows that calve in poor condition can draw on body reserves to only a very limited extent. Hence the level of production of such animals must depend largely on the current level of feed intake. If the level of feeding is low, a high level of production cannot be obtained.

Feeding Programme

What steps should be taken to ensure that cows calve in good condition and are adequately fed thereafter? Clearly, for best results a carefully thought out programme planned well in advance is called for. The details of this programme will naturally vary from farm to farm according to the particular conditions, but there are a number of very important principles that must always be given proper consideration.

First, it must be recognised that adequate amounts of supplementary feed in the form of hay and silage must be conserved for winter use. An average grass crop cut for silage will yield about 10 tons of green material per acre containing 1½ to 2 tons of dry matter. This will produce about 5 to 6 tons of wet silage containing about 1 ton of dry matter.

Experiments carried out at Ruakura over a number of years have shown that dry pregnant Jersey cows fed nothing but silage at 12lb. of dry matter per day will just about maintain condition and gain a little in body-weight. This quantity of dry matter will normally be contained in 60lb. to 70lb. or 1½ cub. ft. of wet silage. Fed at this rate the silage made from 1 acre of grass should be sufficient to provide a full maintenance ration for 4 cows for 6 weeks.

To winter cows successfully on grass and silage it is desirable to have on hand sufficient silage to be able to provide a full maintenance ration for each cow for at least 6 weeks; therefore a minimum of ¼ acre of silage should be cut per cow for wintering. This means that for a 60-cow herd at least 15 acres of silage or an equivalent amount of hay should be saved for winter use.

A second important principle concerns the management of pastures over winter so that these should provide the greatest possible quantity of really high-quality feed. There is absolutely no doubt that a great deal more grass can be grown under a system whereby pastures are alternately grazed and spelled than under one of close and continuous grazing. It is also undoubtedly true that the longer the interval between grazings is the greater the quantity of feed grown will be.

Pastures that are overgrazed as winter approaches, either through being set-stocked or grazed too frequently, have everything against them. They have not the leaf to manufacture more leaf, their root reserves are depleted, and, owing to the lack of cover, ground temperatures become lower than they would otherwise be. For all these reasons their rate of growth slows down.

On the other hand, pastures that are spelled and allowed to develop a substantial grass cover during autumn will continue to grow on into winter. They have the leaf to grow more leaf, they are able to build up root reserves, and ground temperatures do not fall to the same degree. The net result is that such pastures not only grow a great deal more feed, but recover more rapidly after grazing off and come away earlier in spring.

Wintering Policy

A sound wintering policy having regard to these considerations should be organised along the following lines:—

During early April at least two-thirds of the paddocks on the farm should be successively grazed out, harrowed, and thereafter completely spelled from grazing until mid-June. From mid-April the in-calf heifers, together with any cows already dry, should be confined to a relatively small part of the remaining area and fed entirely on silage and/or hay. As the cows dry off they should be added to this group, which by mid-May will comprise virtually all the grown stock on the farm. The fact that these dry stock are being fed only hay and silage means that the calves and those cows still in milk can be rotated over the grass paddocks of the unclosed third of the farm and they also can be given a supplementary ration of silage if they require it.

. . . FEEDING DAIRY HERD

To avoid excessive trampling of any one paddock the dry-stock group as it increases may be slowly shifted round the grazing area behind the few milkers. However, if a paddock is later to be ploughed for a summer crop, it may be preferable to concentrate the dry stock on it to build up its fertility. The whole of the dry stock should continue to be fed more or less entirely on supplementary feed until the middle of June, after which it should be possible to start grazing off the spelled paddocks and carry the whole herd through the rest of the winter on grass alone.

By mid-June the spelled paddocks should be densely covered with leafy, high-quality pasture 4in. to 6in. high and these paddocks grazed off in rotation should provide enough feed to carry the herd from mid-June to mid-August. It is essential that this feed should be carefully rationed to the cows by the use of the electric fence. This should be quite easy to do, as it is a matter of simple arithmetic.

The total area of spelled pasture available should be carefully estimated. It will have to last approximately 60 days. Hence the size of the daily break should be 1/60 of the total area shut up. The more forward paddocks should be grazed off first, the backward ones being given the advantage of a longer growing period before being grazed. At Ruakura it has been found that an acre of pasture spelled from the beginning of May to mid-June will provide a liberal grass ration for 10 cows for about a week.

Under this system the whole of the area originally spelled will have been grazed off by mid-August, but by this time plenty of feed should be available from the regrowth of the earlier-grazed pasture, which will again have been rested for up to 2 months, and from the third of the farm not originally closed up, which from the end of May will have had to carry only a few calves.

Using up Reserves

Some farmers may feel that the programme outlined, which is one whereby the bulk of winter feed reserves is fed out by mid-June, is highly dangerous. Some farmers prefer not to start feeding out until the last possible moment, but this is very poor practice. In a season like this, when many farmers entered the winter with rather meagre reserves of supplementary feed, it is most disturbing to see in June unbroached haystacks and clamps of silage scattered about among vast expanses of bared pastures. The more meagre the winter supplementary feed reserves are and the more critical the feed supply position is, the more important it is for the greater part of these reserves to be fed out early in the season rather than late.

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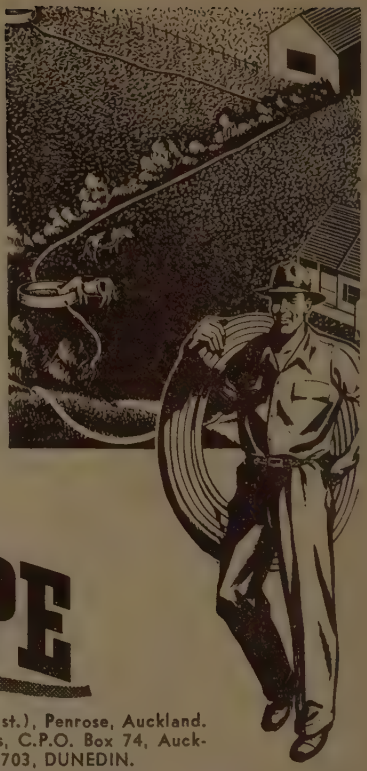

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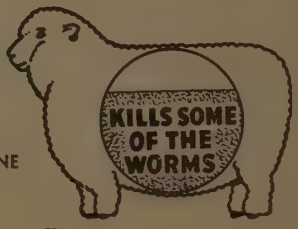

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By feeding out early it is not necessary to feed out so much, and the practice enables a greater total quantity of feed to be grown. It is much more pleasant to feed out in May and June than during July and August, and tractors hauling great loads of silage will do much less damage to pastures in autumn than in late winter and early spring when the ground is really wet. Over the busy calving period it is less laborious to shift an electric fence than to feed out and it is easier to feed off a given area of grass accurately than to ration out material contained in peculiarly shaped pits and clamps, particularly when this material is apt to be of highly variable quality. It is sensible to use stored feed reserves before these deteriorate by being subjected to unnecessarily long storage and are leached by winter rains.

It is much cheaper to stimulate winter growth by applying an autumn dressing of nitrogen in the form of dung and urine voided by silage-fed cows than by buying this nitrogen as sulphate of ammonia at £30 a ton. And, lastly, it must be wise to save the best feed for building up the condition of the cows before calving and of sustaining a high level of production when they come into milk.

Feeding for Summer Production

Of the various summer supplementary feeds for milk production, crops such as turnips and chou moellier are definitely superior to average-quality silage (Table 1). Turnips contain about 9 to 10 per cent. of dry matter, and a reasonably good crop will yield about 1½ tons of dry matter per acre. They excel in that they mature quickly and their dry matter is very low in fibre and extremely digestible (90 per cent.). A good crop of chou moellier will produce a greater yield of dry matter per acre (3 to 4 tons), but this dry matter, though high in protein, contains more fibre than does that of turnips and is much less digestible (70 per cent.). Wastage in feeding off can be very high with chou moellier.

One acre of crop per 10 to 15 cows should suffice in most cases, but cropping should on no account be undertaken by anyone either unable or unwilling to make a thoroughly efficient job of the cultivation involved.

Silage Quality

Silage as generally made is high in fibre and of low digestibility (60 per cent.) and is far from being a first-class milk - producing feed. This is not in the least surprising when one considers the stage of growth of the material from which silage is generally made. Much of the grass made into silage would not support a satisfactory level of milk production even if it were grazed off as pasture.

Nevertheless silage can be a very useful standby to prevent really serious loss of production over the dry months, but if it is to be used at this time of year, it should be of really good quality. This means cutting pasture at an early, leafy stage and wilting it if possible to reduce the moisture content. The wintering policy already outlined, if followed, will help considerably here, for it will enable silage making to be started much earlier in the season. This earlier cutting will result in a better aftermath, which in turn will help to solve the summer feed problem.

Irrigation

Irrigation will undoubtedly produce grass of high milk-producing quality and has the advantage over other methods of increasing total feed production per acre. The water should be applied to first-class pastures that are capable of responding, and it is essential that sufficient water and labour should be available to irrigate an adequate area, say 1 acre for every 5 cows carried.

Concentrates

The feeding of concentrates is seldom if ever economic except where milk is being produced for town supply. In experiments at Ruakura the value of the extra butterfat produced has been sufficient to pay for less than half the cost of the concentrates fed.

The final choice from among the methods available for filling the summer feed gap will depend on many considerations other than those of feed quality. On partially developed farms, on farms where a programme of pasture renovation and improvement is either necessary or already under way, on farms where the summer feed problem is a pressing one in most years, and on farms where the necessary machinery is already at hand, crops may provide the best answer. On farms less constantly subject to severe summer drought or on those already carrying highly improved pastures silage should provide the more economic solution. On farms owned by men who are experts not only at grassland management but in bloat control special-purpose pastures may possibly have a place.

Importance of Herd Quality

The importance of herd quality should here be emphasised. There is not the slightest doubt that much can be done to raise production above present levels by better feeding methods. Nevertheless there is no more disappointing and disheartening occupation than taking infinite pains to feed cows of inferior quality really well in an endeavour to secure really high per-cow and per-acre yields.

For some years at Ruakura the intake of cows at pasture has been measured and the results so far obtained have enabled an estimation to be made of the way in which the amount of feed eaten by a cow varies according to its body-weight and level of production (Table 2). It has also been possible to estimate the amounts of butterfat it is possible to produce from a given amount of feed by cattle of different body-weights and different production levels.

It is generally accepted that an acre of really first-class, high-producing pasture will yield up to 14,000lb. of dry matter per acre. Table 3 shows the amount of butterfat that such a pasture could produce if the whole of the feed produced were completely and directly used by herds of cattle of varying qualities. Allowance has been made in the estimates for the feed requirements of a normal complement of young stock.

The potential butterfat production per acre varies from 256lb. for herds averaging 850lb. body-weight and producing 200lb. of butterfat per cow to 419lb. for herds of similar body-weight producing 400lb. of butterfat per cow. This figure of 419lb. of butterfat per acre represents a useful target for all. There is at least this about it; it is much more likely to be achieved than some that have been proposed by people who have known a lot about the productivity of pastures but little about the feed requirements of grazing dairy cattle.

TABLE 1—NUTRITIVE VALUE OF FEEDS

Feed	Digestibility	Fibre	Protein
	Per cent.	Per cent.	Per cent.
Spring pasture ..	75	19	22
Autumn-saved pasture	70	20	20
Summer pasture ..	60	20	15
Turnips	90	10	12
Lucerne	63	30	20
Kale	70	15	16
Silage	60	35	12
Hay	50	35	8

TABLE 2—FEED EATEN PER LB. OF BUTTERFAT

Body-weight of cow	Butterfat yield per cow (lb.) 200	250	300	350	400
	Feed eaten (Lb. of dry matter)				
lb.					
750	52	44	39	35	32
850	55	46	41	36	33
950	58	49	43	38	35

TABLE 3—BUTTERFAT PRODUCTION PER ACRE FROM COWS WITH AVERAGE BODY-WEIGHT OF 850LB.

Pasture yield lb. dry matter	Butterfat yield per cow (lb.) 200	250	300	350	400
	Butterfat per acre (lb)				
8,000	146	173	198	220	240
14,000	256	303	346	384	419

Care of Livestock during February

Contributed by the Animal Research Division

PREPARATIONS FOR TUPPING

IF ewes have been held on short pasture since weaning, they should now be in good hard condition. About 21 days before tupping they should be crutched and given the best pasture available. Experiments at the Department of Agriculture's Animal Research Station, Ruakura, have shown that flushing ewes for 3 weeks before tupping and keeping them on good pasture for 3 weeks after tupping begins increases the number of lambs marked by 20 per cent. Rams, too, should be crutched and flushed for about 3 weeks before tupping. They should be dipped before the flushing period, as dipping too close to tupping appears to reduce ram fertility.

COBALT DEFICIENCY

Bush sickness can be prevented completely by topdressing annually with cobaltised superphosphate, and in the North Island at least this is best applied in the annual autumn topdressing. Cobaltised superphosphate prepared in North Island works contains 3lb. of cobalt sulphate per ton; 2cwt. of this fertiliser contains sufficient cobalt for 1 acre. In the South Island cobaltised superphosphate contains 6lb. of cobalt sulphate per ton, and 1cwt. of this fertiliser per acre contains sufficient cobalt. If greater quantities of fertiliser than those indicated are used, the additional amount need not be cobaltised. For fuller details consult the Department of Agriculture's Bulletin No. 180.

SOWS AND WEANERS

Sows with litters should be fed 4 gallons of skimmed milk plus 2/3 gallon per pig suckled. Sows and litters should be allowed at least 2 hours' grazing per day. It is an advantage to provide water sprays for both suckling and dry sows during summer; since pigs possess very few sweat glands, they can be kept cool only by the evaporation of water from the skin. Litters over 3 weeks of age must have skimmed milk and meal available at all times. Observations at Ruakura have shown that piglets suckle at intervals of 75 to 90 minutes throughout the 24 hours, and after the sixth week they visit the creep after each suckling. Good creep management can add 6lb. to 10lb. per pig to the weaning weight. Weaned sows must be well fed to ensure successful mating. A ration of 4 to 6 gallons of skimmed milk daily plus grass is essential. Weaned pigs should be fed 1½ to 2 gallons of skimmed milk daily. If the milk available is not sufficient to provide this, the feeding of meal to supplement the milk ration, replacing 1 gallon of milk with 1lb. of meal, is highly profitable at present meal and meat prices.

PULLORUM DISEASE IN POULTRY

Preparations should now be made for the autumn hatch by blood testing the flock for pullorum disease and by cleaning and fumigating the incubators. A vacuum cleaner is ideal for cleaning and advice on fumigation may be obtained from the local Poultry Instructor.

BOVINE INFERTILITY

Bovine infertility may be due to several infectious diseases which are known to be present in New Zealand and for which reliable tests are now available. If more than the usual number of cows are still empty, veterinary assistance should be sought promptly.

FACIAL ECZEMA

If warm rains fall in February after a spell of hot, dry weather, facial eczema is likely to occur in districts which are usually affected. Experience during recent years has shown conclusively that the disease can be prevented by shutting sheep up at a rate which leaves no pasture in the paddock after 24 hours. Sheep should be shut up as soon as rains fall and confined until the weather becomes either hot and dry or much cooler and the pasture visibly hardens. If hot, dry periods occur, plans should be made for action along these lines. Good hay at the rate of 2lb. per sheep per day will prevent loss of condition. Even if adequate hay is not available, when ample water is provided ewes are not harmed by 1 or 2 weeks' starvation. It is better to take precautions too often than to run the risk of a disastrous outbreak of facial eczema. If crops of rape, kale, turnips, or chou moellier are available, they can be grazed safely during the dangerous period. The grazing of such crops is the only satisfactory way of preventing the disease in lambs, which react badly to restricted grazing. Lucerne has not proved safe, possibly because of ryegrass, which is frequently present in it as a weed, but in east coast districts paddocks of pure white clover are safe and lambs do well on them. An article giving full details of the cause and prevention of facial eczema appeared in the December 1955 issue of the "Journal" and is available as Bulletin No. 388.

CARE OF CALVES

Autumn is a critical period for calves. Deaths during winter can be eliminated by rotating the calves through the paddocks ahead of the cows at intervals of 3 or 4 days. If this is not being done, it should be begun immediately. Calves treated in such a way will be up to 100lb. heavier as yearlings than those kept confined in a calf paddock. If calves are unthrifty and scouring, it may be necessary to give 2 or 3 doses of phenothiazine at 3-weekly intervals, but this is seldom necessary with calves which are rotationally grazed.

COPPER DEFICIENCY

Scouring in cattle and staggering in lambs grazing on peat and other copper-deficient land can be prevented by topdressing pastures in autumn with 5lb. of bluestone per acre. Copperised superphosphate is now available or the bluestone may be mixed with lime. For fuller particulars the Department's Bulletin No. 238 should be consulted.

VITAMIN A FOR GROWING AND LAYING BIRDS

Vitamin A is essential to poultry for protection against various infections, particularly colds and contagious catarrh. Poor egg production is a common feature of an inadequate supply of vitamin A to laying birds. Greenfeed is a useful source of vitamin A, but at certain periods of the year when this becomes scarce or poor in quality it may be of little value. Growing birds on open range may suffer from vitamin A deficiency during very prolonged spells of dry weather. Though there is apparently plenty of greenfeed available, it may be of very poor quality. The addition of a vitamin A supplement such as fish liver oil during times of greenfeed shortage is advisable for both growing and laying birds. The amounts used vary according to the age of the birds and the potency of the oil used. The quantity advised by the manufacturer of the oil should be added to the diet. Further advice on the use of vitamin A supplements may be obtained from the local Poultry Instructor of the Department of Agriculture, and a special leaflet on the subject is available from main offices of the Department.

Autumn Management of Pastures

Seasonal Notes by the Extension Division

ATTENTION should now be given to general planning of autumn pasture management, which will have to be reviewed month by month according to seasonal growth conditions.

DAIRY FARMS

AUTUMN growth on dairy farms is usually above the requirements of the herd at that time, and good pasture management demands that the surplus be held for use in late winter and early spring, when grass growth is less than the needs of the stock carried. After the usual March rains at least 40 per cent. of the farm should be closed for autumn-saved pastures. It is not necessary to close all this area at one time, and paddocks can be closed successively, beginning with the poorer paddocks, as these will take longer to reach the desired height of 6in. to 8in. by the time they will be grazed at the end of winter.

Continual closing of the same paddocks year after year should be avoided, as this tends to increase the Yorkshire fog and reduce the white clover. Paddocks selected should be dominant ryegrass, but 2- and 3-year-old pastures that were sown with short-rotation ryegrass in the mixture are also suitable. On no account should newly sown pastures be selected. During the colder months the clovers make little growth and will be smothered out by the taller-growing grasses unless these are controlled by frequent grazings. As autumn-saved pasture has to be utilised during the wettest months of the year, only free-draining or dry paddocks should be closed. Wetter paddocks are likely to become poached with the heavy concentration of dairy cows, and recovery of the damaged sward will be slower.

FAT LAMB FARMS

As is the case on a dairy farm the surplus autumn growth on a fat lamb farm should be saved for late winter and early spring feed, but its height must be controlled by the judicious use of cattle, preferably by rotationally grazing them in one mob. Between tupping and a month before lambing the ewes should be rotated around a portion of the farm in one or two flocks, thus conserving feed on the balance of the farm for use before and during lambing. Up to half the farm can be saved for use around the lambing period, as ewes can be "done hard" during autumn provided they have access to good grass one month before lambing to prevent sleepy sickness.

HILL COUNTRY FARMS

The same basic principle of pasture management can be applied to a hill country farm by limiting the feed given to the stock and retaining the surplus for times of shortage or for a special purpose. Thus paddocks closed after weaning can be used for flushing ewes for 3 weeks before tupping to induce twinning. Crops are particularly valuable for this. For 2 to 3 months in late autumn the ewes can be "done hard" by rotating them on only a portion of the farm and using the saved grass during the critical period in late winter and early spring just before lambing. Some of this saved grass will also be available for wintering run cattle. Swedes or chou moellier for July-August feeding by both ewes and cattle will allow the grass to come away on the balance of the farm and be available before and during lambing.

—G. A. BLAKE

* * *

AUTUMN-SOWN PASTURES

EARLY attention should be given to the selection and purchase of seed and seed-bed preparations for autumn-sown grass. Advice on seeds mixtures for special local conditions should be sought from Instructors in Agriculture of the Extension Division.

When the pasture species to be sown is being determined consideration has to be given to soil fertility and moisture and type of grazing. Of the clovers white clover is the main species and is suitable for all areas except those which are exceptionally dry or wet. Subterranean clover is suited to dry conditions and *Lotus uliginosus* (*major*) withstands overshading. Red clover is a temporary clover of use where fertility is high. Perennial ryegrass, the chief pasture species, and white clover are suited to conditions similar to those required by red clover.

Short-rotation ryegrass requires high fertility and a moist soil and does not like hard grazing. Cocksfoot likes lax grazing and withstands drought. Crested dogstail is suited to medium fertility under sheep grazing. Paspalum requires warm or hot summers.

Dairying is usually carried out where fertility is high and climate is moist. Grass seed mixtures therefore usually consist of about equal amounts of short-rotation and perennial ryegrasses and some white and red clovers and cocksfoot, with paspalum added in northern coastal districts.

Sheep farming is usually carried out under more extreme conditions. Where fertility is high the seeds mixture should consist of mainly perennial ryegrass with white and red clovers, but where fertility is not so high and the land is inclined to dry out cocksfoot, crested dogstail, and subterranean clover should be included.

On hill country the chief need is to introduce clovers—*Lotus uliginosus* (*major*) for moist hills where fern, pasture, and other growth are liable to get away, subterranean clover for dry hills, and white clover almost everywhere.

—J. E. BELL

* * *

OVERSOWING HILL COUNTRY

THE establishment of clovers by surface sowing on hill country swards reverted to browntop, danthonia, and sweet vernal can now be regarded as sound practice where topdressing is done. Phosphatic topdressing of hill country gives little or no response unless clovers are present, and on most country white, subterranean, and red clovers must be introduced by oversowing as an integral part of the topdressing programme.

In the North Island autumn sowings usually give the most satisfactory results. Oversowing should be done as early as autumn rains will allow. The ground should be moist enough to prevent its drying out before the clover seedlings have established properly. The earlier seeding is in autumn the better establishment will be provided the dry summer weather has broken and there is no prolonged dry spell after sowing.

Clovers strike best on areas where all rank growth has been removed, the sward has opened up, and bare ground is exposed. Unless the seed falls close enough to moist soil, the seedling clover has little or no chance of survival.

In the choice of clovers for oversowing, white clover is by far the most important species and should be included in all mixtures except on the driest soils. White clover thrives best where the rainfall is over 40in. a year and the soil has good moisture retention. Subterranean clover should be used where the rainfall is below 40in., and particularly where summer and early autumn are very dry and the soils light. White clover should be sown at 1lb. to 2lb. per acre and subterranean clover at 3lb. to 5lb. per acre.

Though it is important to sow clovers at the right time of year, the initial topdressing with phosphatic fertilisers can be done at periods before and up to the time of oversowing.

—W. B. H. SMITH

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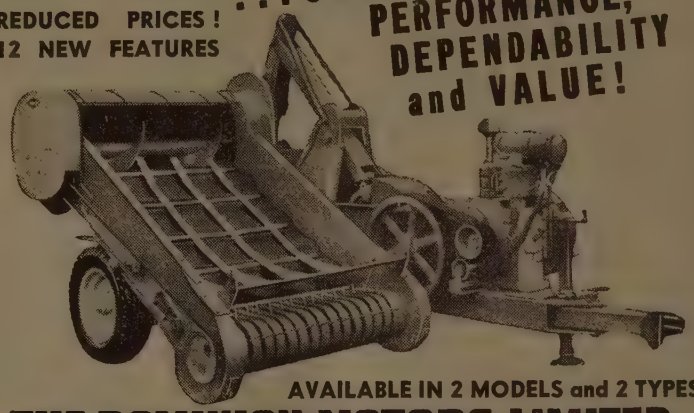

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Light-weight Concrete as a Building Material

IN recent years new theories about concrete have been evolved and have become the basis of new techniques which alter the concept of concrete as a constructional material. One of these techniques has been the development of light-weight concrete aggregate. The characteristics of certain light-weight aggregates enable amateur production of pre-cast concrete units for certain building work to be undertaken successfully on the farm, and this article by H. W. T. Eggers, Engineer, Department of Agriculture, Wellington, discusses these materials and how they are handled. In this first section of the article he explains the advantages and disadvantages of light-weight concrete, and in the concluding section, which will appear in next month's "Journal", he will deal with the properties of perlite concrete and describe how building units can be cast in it.

IN its general sense the term concrete means a stone-like material composed of graded rock particles bound together with a Portland cement mortar.

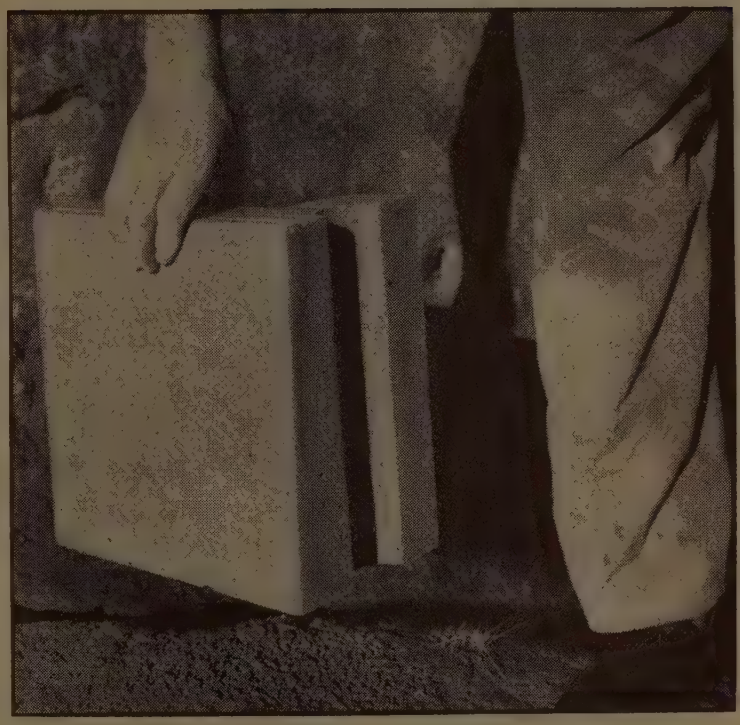
As the basic ingredient is stone, the physical characteristics of natural-aggregate concrete are similar to those of stone; it is heavy in unit volume, has low insulating qualities, and is high in crushing strength.

The properties of concrete will naturally vary according to the characteristics and quantities of the various ingredients used in its manufacture. If the types of aggregate and cement are varied, or their proportions in the mix changed, concrete of different types can be obtained; for example, a greater proportion of cement produces a stronger, more waterproof concrete. Again, the use of light-weight aggregates produces a lighter concrete with higher insulating qualities but with a proportionate decrease in strength.

A change in the type of cement can give quick-setting properties, waterproofing qualities, and early high strength. A change in the type of aggregate can give good insulation and lightness. Other ingredients can also be used to produce other characteristics.

The term concrete thus no longer applies only to the original stone-like material, but now includes materials which can be made to possess any combination of characteristics of weight, strength, insulation, water resistance, etc., to suit any particular constructional requirements.

In the construction of any concrete building the choice of concrete to be used must therefore depend on the purpose for which the building is designed.



This concrete block, made from light-weight aggregate, weighs only 17lb. A block of the same size in ordinary concrete would weigh 60lb.

Professional and Amateur Concrete

Concrete is either professional or amateur. Professional concrete is that produced to specification and by close observance of rules laid down for the grading and sizing of aggregates, ratio of cement and water, consistency of the plastic mix, and correct measuring of quantities. Amateur concrete is that produced by lax observance of rules, by the rough and ready measuring of quantities, and by the use of unspecified aggregate.

The making of professional concrete usually requires facilities and close control which are not available to the amateur but which are essential to the commercial production of concrete units. Any farm-produced concrete must be classed as amateur, as facilities are not usually available on the farm for producing professional concrete. However, with the use of specified aggregates and the exercise of closer than normal control the farmer (or anyone else) can take advantage of light-weight concrete for his building construction.

To obtain the information concerning new materials contained in this article a close investigation of these materials has been made from the point of view of the amateur. All experiments have been conducted under amateur conditions, only equipment and materials available to the amateur being used. An extensive knowledge of concrete is therefore not required to take advantage of the information given.

Characteristics of New Materials

Concrete can now be produced with new characteristics which can be used to advantage for construction purposes. Some sacrifice of strength must be made to produce some of these characteristics, but as the compressive strength of concrete is its greatest factor, this sacrifice can be made without detriment and a suitable compromise between strength and other desired characteristics can always be found to suit particular constructional requirements.

New theories in the use of steel for reinforcing have been evolved and new materials developed, all of which are aimed at producing a lighter concrete for building purposes.

New methods in the use of steel reinforcing are pre- and post-stress-

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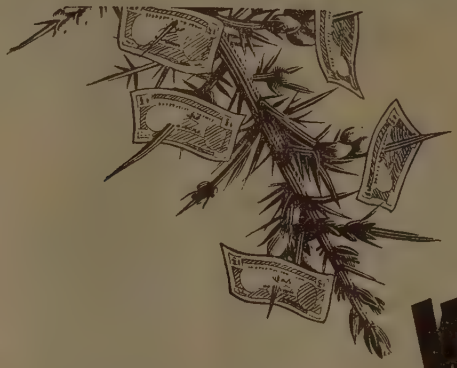

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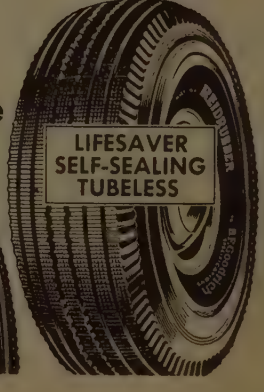

ing, in which instead of the steel being used to counter tension in the concrete it is used to exert a compressive force on the concrete. This can be likened to making a number of blocks rigid by clamping them together with a bolt. As less concrete is required for equivalent strength, a saving in weight and cost of material is effected.

New methods which decrease the weight of concrete and its strength but increase its insulating value are based on cellular construction of the concrete as opposed to a dense structure with ordinary concrete. They are used in what is known as no-fines (containing no sand) concrete or air-entrained or foamed concrete.

The same theory of cellular construction is applied in light-weight aggregate concrete, but the cellular characteristics in this are given to the aggregate rather than to the concrete.

Methods and Materials Available to Amateur

Though all the methods and materials described are available to the concrete manufacturer and constructor, the use that the amateur can make of them for his own building purposes is limited.

The technique of pre-stressing is no longer a factory process, as facilities are available to enable the amateur to produce his own articles such as pre-stressed fence posts with a small capital outlay for equipment. This method was described in an article in the November issue of the "Journal".

No-fines concrete and air-entrained or foamed concrete, though offering great advantages in weight saving and insulation, are not suitable materials for the amateur to produce. No-fines concrete requires graded aggregate which the amateur could not specify. Air-entrained or foamed concrete, requires special foam-making or concrete-mixing apparatus. The mixing apparatus for one process of foamed concrete manufacture is too expensive to be an economical proposition for the amateur and the process also requires close control. Another process, which is much simpler, also requires capital outlay for foam-producing apparatus.

In the light-weight aggregate field perlite concrete aggregate is probably the most versatile.

Light-weight Aggregates

Ordinary concrete made from natural aggregates such as sand and gravel has a unit density of between 140lb. and 150lb. per cubic foot. This density can be decreased to practically any degree by the use of light-weight aggregates, but with the reduction in density there is a corresponding decrease in strength, though insulation value rises.

Light - weight aggregates can be classified into three groups:—

1. Natural light-weight aggregates such as pumice.

2. Manufactured light - weight aggregates such as coke breeze and perlite.

3. Pre - treated natural light-weight aggregates (proprietary products).

When the weight of concrete is reduced to convenient limits by the use of these aggregates the resultant concrete except for that made from pre-treated natural light-weight aggregates is so reduced in strength that it is unsuitable for load-bearing structural purposes. It is, however, eminently suitable for concrete masonry units required for insulation purposes; for example, coke breeze or pumice concrete blocks have excellent insulation characteristics but no structural strength.

A saving in weight of nearly 240lb. can be made by the use of light-weight aggregate in the making of concrete panels of the size shown above. The light-weight concrete panel above weighs 92lb.; a similar panel in ordinary concrete weighs 330lb.

Pumice concrete fire surrounds and pre-cast chimney blocks are excellent for the purpose for which they are manufactured, as their heat transmission value is low, they are reasonably light to handle, and the lower units are strong enough to carry the weight of the units above.

Concrete Uniformity

Uniformity is necessary for any concrete units of the same type. For example, in the construction of a wall with blocks it is essential that the strength of each block does not vary appreciably and limits of variation are closely defined.

The professional producer of concrete by control and within limits can overcome non-uniformity of raw material to ensure that his day-to-day products are reasonably uniform. This cannot be done by the amateur, who must rely for the uniformity or consistency of the concrete he produces on the uniformity of available raw materials and the consistency of his technique. He can control consistency of technique, but cannot control uniformity of raw materials.

As any pumice aggregate available to the amateur is not uniform, its use by other than professional concrete manufacturers is not recommended. Pumice varies in structure from district to district. Some has a connected cellular structure, which absorbs water much more readily than an unconnected cellular structure. Sometimes the pumice may be combined with sand and sometimes it may be free of sand. The manufacturer who is using this material daily knows how to deal with any inconsistency of raw

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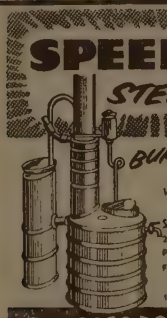

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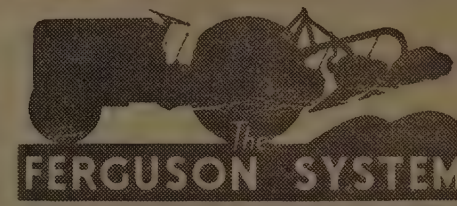

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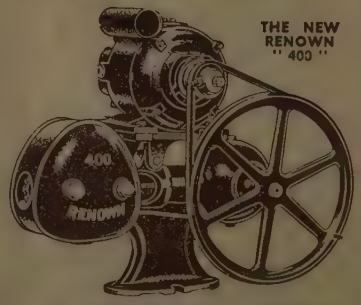

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material so that the grade of concrete he produces is reasonably uniform.

Coke breeze also varies, depending on the type of coke and the treatment it has received as coal during gas manufacture.

With either of these aggregates it is difficult for the amateur to produce consistent or uniform concrete.

Manufactured light-weight aggregates (other than coke breeze) are produced from shales or clays which are heated to near fusing point and then rapidly cooled. This cooling imprisons the prefusion gases given off and produces a material which is permeated with gas pockets and is therefore of light weight per unit of volume. The same process is used by Nature to produce pumice, but the cooling process, being slow, results in a much softer material.

This processing can produce a consistent aggregate from any particular deposit of raw material. Resultant aggregates can vary in characteristics with different deposits of raw material, but not to the extent of affecting handling techniques.

The proprietary products of pre-treated natural light-weight aggregates are blends of pumice aggregate and other light-weight materials such as perlite or vermiculite. The pumice aggregate is pre-treated to give the granules a hard surface coating which greatly increases the strength of the concrete for a given density. As insulation is related to density, this material has high insulating value and proportionately high strength and yet is light in weight.

Because of its nature and the necessity for compaction to produce strength this aggregate is not suitable for the amateur to use; special equipment is required for its manufacture into concrete and treatment in the moulds. For example, the ordinary bowl mixer which the amateur would use is not suitable for this aggregate, as segregation takes place; a paddle and pan type of mixer gives much more satisfactory results.

This aggregate is ideally suited to factory production of concrete units, because the preparation of the concrete and its treatment in moulds by machine results in a concrete which is dense, has high insulating value, and is relatively light in weight.

Concrete made with this and other light-weight aggregates has certain characteristics which affect its suitability for certain purposes. These characteristics will be discussed later.

Perlite Aggregate

Perlite is a siliceous volcanic rock which when treated by heating and cooling in the manner described above is expanded to form light-weight, non-combustible, glass-like particles of cellular structure. This material, white or light grey, is about a tenth of the weight of sand or gravel. Unlike pumice or other light-weight aggregates, the granules or particles of perlite aggregate will not absorb moisture, which is a big advantage in its manufacture into concrete.

Perlite aggregate consists of expanded perlite sized for use in two grades, plaster grade and concrete grade. The many tiny glass-sealed cells in each particle of expanded perlite make it highly insulating, and it can be used to advantage in light-weight, fire-retarding plaster or insulating concrete in place of sand or gravel.

Because it is easily mixed by use of conventional equipment and the resultant concrete is easily handled and trowelled into moulds, perlite aggregate is the most suitable light-weight aggregate for amateur use. It does not segregate, but remains uniform, and a very wide range of strength, density (weight), and insulating qualities can be obtained by a variation of mix proportions. Perlite aggregate can also be used to reduce the density of sand-cement concrete, but the strength factor of perlite-sand blend concrete is uncertain, being dependent on the sand grading. Perlite sand blending will be discussed in the concluding part of this article.

This aggregate is consistent and the amateur can obtain reasonably consistent concrete over any number of batches without being concerned with non-uniform raw materials. It is equally suitable for poured concrete mouldings or for blockmaking and can be floated to a very smooth finish for wall plastering or floor insulation.

Concrete made from perlite or pre-treated natural light-weight aggregates can be sawn, planed, or chiselled with ordinary woodworking tools. Ordinary nails driven into concrete made from a pre-treated natural light-weight aggregate have some holding strength, but special nails are required for perlite concrete and these will be described in the concluding part of this article.

Characteristics of Light-weight Concrete

Light-weight aggregates require treatment that is different from that for ordinary concrete made from natural aggregates. For example, some pumice aggregates have a deceptive characteristic when being mixed with water. The cellular nature of the pumice rapidly absorbs the water as it is applied, but prolonged mixing releases it, ultimately producing too wet a mix if wetness has been judged from first signs.

Again, concrete produced with these aggregates has ageing characteristics because of moisture which is inherent with the materials. All concrete shrinks during the hydration period of the cement and has a certain amount of subsequent movement through moisture and temperature changes. This subsequent movement occurs continuously, the materials never reaching permanent stability.

As light-weight aggregates give the concrete a high insulating value, light-weight aggregate concrete takes longer to dry out than ordinary concrete. Because of its cellular structure it has a greater ability to retain moisture, and when it is drying or liberating moisture from the centre outward internal stresses are set up which find an outlet in the warping, twisting, or cracking of the moulding. This movement takes place for some months after a moulding has been cast and continues until such time as a moisture equilibrium has been reached throughout it. Movement can be only partially controlled by reinforcing, as it is an expression of internal stressing and therefore not possible to counter with steel in every direction.

However, the movement can be countered to some extent by correct stacking of light-weight concrete units. Stacks should be so arranged that they permit free access of air to all sides of units to ensure uniform drying. They should also be covered as protection from rain.

This characteristic of movement makes light-weight aggregate concrete unsuitable for the manufacture of any large-dimensioned units, but it is not severe enough to be detrimental in short-dimensioned building units such as blocks or short panels. This does not apply with concrete in which the characteristic of moisture movement has been eliminated and the concrete given permanent stability.

Internal stress, which causes movement, can be relieved to some extent by design. For example, sharp corners in mouldings or relatively heavy ribs or flanges on light panels are subject to cracking, which may be severe, whereas rounded corners and correctly proportioned flanges and ribs reduce the tendency to crack to a minimum.

Though movement cracking in units may not be detrimental for some building construction, such as animal housing, it makes a handling difficulty, because cracked units can quite easily fracture completely during handling. Where the entrance of moisture must be prevented cracked building units must be discarded.

If the movement which occurs in concrete masonry units after the maturing period and which is caused by changes of humidity and wetting cycles could be prevented, one of the factors against the use of concrete masonry as a building material would be removed.

Permanent stability can be obtained with perlite concrete by the addition to the mix of a special agent which is described in the concluding section of this article.

Use of Plastic Siphons for Contour Irrigation

By W. A. LUNN, Fields Instructor, Dunedin, and A. D. HALL, Irrigation Extension Officer, Ashburton, both of the Department of Agriculture

THE illustration shows a method of irrigating which could be wholly or partly adopted in contour irrigation schemes in areas which are typical of Central Otago farming. Every farmer who irrigates knows the amount of shovel work involved in turning out water from contour ditches, especially on steep slopes where the banks are high. The use of siphons eliminates this work and any chance of cutting down the time and labour involved should appeal to most. Irrigation with siphons is not new, but until plastic and aluminium tubes became available the weight of the siphons limited their use. Now up to twenty 4ft. lengths of 2in. tubing can be carried quite easily in a grain sack.

IN the United States of America the use of siphons is standard practice for furrow-irrigated crops, and there small-diameter tubes are used to divert equal amounts of water down each row. Tubes up to 8in. in diameter are sometimes used to discharge water from main ditches on to levelled land, thus replacing head-gates.

The plastic tubes shown in the photograph were home made. They were bent in hot water with the aid of a spiral spring to prevent distortion at the bends. However, it would be worth while to buy ready-made aluminium or plastic siphons, as not much is saved by bending them on the farm.

Method of Starting Flow

A flow can be started in the tubes by dropping the whole tube into the race, holding one hand over one end of the tube, and bringing this end down over the bank while the other end is kept in the water. When the outside end is below the level of the race end the hand is released and the flow begins.

A simpler method, but one which requires a little experience, is to hold the tube with one hand over the top and scuff the lower end under the surface of the water. A vacuum is created which causes the water to rise inside and fill the tube. At this stage the tube is lowered into the position required.

Spacing of Siphons

As with other forms of surface irrigation good ditches and a slow, even fall round the race are a big help when siphons are used, as these allow the water when checked to bank up over a reasonable distance, thus allowing the siphons to be evenly spaced and have a good depth of water to work in.

The tubes shown are of 2in. diameter and are about the optimum size. Smaller tubes are less efficient and a larger number and more work would be required to lift the same quantity of water.

These siphons may be regarded by some as being rather expensive, but only 12 to 15 tubes are required to lift one cusec or head of water from a ditch under average conditions. They may be spaced 10ft. to 15ft. apart or spacing may be closer or wider if required.

Siphons are light and easy to use. Their adoption for hillside irrigation should allow a better distribution of water. As the cutting of gaps in the banks is obviated, no waste from leaks should occur. There is no doubt that siphons have a place in this form of irrigation and should allow more ground to be covered with the same amount of water.

Trees on the Farm

Pruning the Woodlot

A WOODLOT is a living thing which will grow without assistance from man. However, its usefulness can be vastly improved by correct planning and by a modicum of care at certain stages in its life cycle; in other words, by good management. Far too often there is neither proper planning nor any attempt at subsequent tending and the result falls much below perfection. This article on pruning by W. H. Jolliffe, Forestry Extension Officer, New Zealand Forest Service, will help those who wish to improve their woodlots.

▲ Low pruning with a saw with a pistol grip handle. With more heavily branched species a longer handle is desirable.

← High pruning with saws attached to 12ft. poles.

MOST woodlots in New Zealand are composed of exotic conifers (pines, larches, cedars, firs, and spruces) which, unlike the majority of hardwoods, do not shed their branches naturally. This is partly due to the general habit of establishing even-aged plantations in which removal of side branches usually has to be done by hand. In native forests or in uneven-aged plantations, on the other hand, dead branches are knocked off by lower members of the stand swaying in the wind. Manual pruning is divided into low pruning (the removal of branches to about 7ft. from the ground) and high pruning (the further removal of branches to about 18ft. up), each being done at different stages in the development of the stand.

TREES ON THE FARM . . .

Low Pruning

Low pruning is advisable for several reasons:—

1. As a step in the production of higher-quality timber; for this purpose it should be followed some years later by high pruning.

2. As an aid in protection against fire; a ground fire will not so easily become a crown fire if the stand has been completely low pruned.

3. As an improver of access within the stand for forestry purposes such as marking for thinning or for farm purposes where, say, the stand is used as shelter for stock.

The time to start pruning is when the branches are dead or nearly so up to about 7ft. from the ground. The cutting off of green branches provides a way of attack by harmful insects and fungi and should not be done except where branches would otherwise grow very big; for example, where there is no side shade.

Pruning is best done with a straight or curved pruning saw mounted on an adze or a slasher handle. Such a saw is usually stiff and the teeth point toward the handle so that the cut is made on the pull stroke. The stiffness of the blade and the length of the handle enable the saw to be poked in among the branches to begin the operation.

Pruning with a sharp axe or slasher is safe only in the hands of an experienced axeman. A stout stick can be used to knock off small brittle branches as are found on larches and on such trees as close-grown cypresses and spruce. Whatever tool is used the main care should be that the bark is not injured so that pests and diseases can enter.

The branches of pines and other thick-barked species should be cut off close to the trunk to allow the cut surface to be more quickly covered with successive layers of wood. Also it is desirable to keep the knotty core as small as possible. With cypresses and other thin-barked species, however, it is preferable to leave a small stub rather than risk damage to the bark.

All standing trees should be low pruned. Any that are not worth pruning should be felled unless they are on the fringe of the plantation, where their retention may serve a protective function.

Where possible the litter of cut branches resulting from pruning should be burnt. Care must be taken, however, against scorching nearby trunks; it is better to leave the litter on the ground than take such a risk.

High Pruning

If high-quality timber is required, low pruning should be followed by high pruning. This operation is normally restricted to the final-crop trees (say 100 to 150 per acre) and hence it is necessary to select the trees at this stage. Those chosen will naturally be dominant trees of good form and as regularly spaced as possible. The poorer trees (undersized, double-leadered, or diseased) will normally be removed in thinnings as the final-crop trees need more room in which to develop.

High pruning is usually carried to a whorl of branches about 18ft. from the ground, which means that the butt length of 20ft. to 21ft. will be clean timber. It may be done in one operation, but it is better carried out in two steps; that is, to, say, 13ft. 3 to 5 years after the low pruning and to 18ft. some years later still.

The job may be done from a ladder with the same type of saw as was used for low pruning, but it is more easily done with a curved pruning saw mounted on a 12ft. pole. For the latter a piece of straight-grained Oregon pine about 1¼in. square in cross-section is suitable.

Correspondence Courses in Agriculture

CORRESPONDENCE courses in agricultural subjects are provided by the Correspondence School of the Department of Education, Wellington, for students in any part of New Zealand who cannot attend day or evening classes in their localities.

THE School provides post-primary courses in agriculture up to School Certificate standard for both full-time and part-time pupils. Applicants for courses who have had no agricultural experience or have not previously taken agricultural subjects should apply for one of the introductory courses.

Free post-primary education for 5 years or until the end of the year in which he or she reaches the age of 19 (whichever is the longer) is granted to every person in New Zealand. Applicants for correspondence courses who have not completed a 5-year period of free post-primary education are therefore entitled to receive their courses free until they have completed that period. Students who already have had 5 years' free post-primary education have to pay fees for courses, but these fees are low and text-books may be hired.

Further information may be obtained from the Headmaster, Correspondence School, Clifton Terrace, Wellington.

Following are the agricultural courses provided:—

Farm Practice

A 1-year course dealing briefly with the more important branches of New Zealand's agriculture. This course is used as an introduction to the agricultural subjects of School Certificate, but it is also suitable for general study by pupils and adults interested in farming in New Zealand.

School Certificate Subjects

General agriculture—A 2-year course covering how a plant grows, seed certification; soils, fertilisers, and manures; crops and pastures; the main types of plant and animal life of interest to the farmer.

Animal husbandry—A 2-year course covering the cow, pig, horse, and sheep; principal breeds; current economic problems in stock farming; wool; pastures and their management; supplementary crops; genetics; physiology and diseases.

Dairying—A 2-year course covering milk, cream, butter, and cheese; their production and distribution; herd testing and improvement; care and management of cattle; use of dairy products.

Biology—A 2-year course covering the form and function of plants and animals in relation to their environments.

Horticulture—A 2-year course covering plant form, function, and growth in relation to gardening matters.

The School Certificate subjects may also be taken for general knowledge by non-examination pupils. Any number of the above courses can be studied at the same time and provision is made for both written and practical work.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during February as follows:—

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

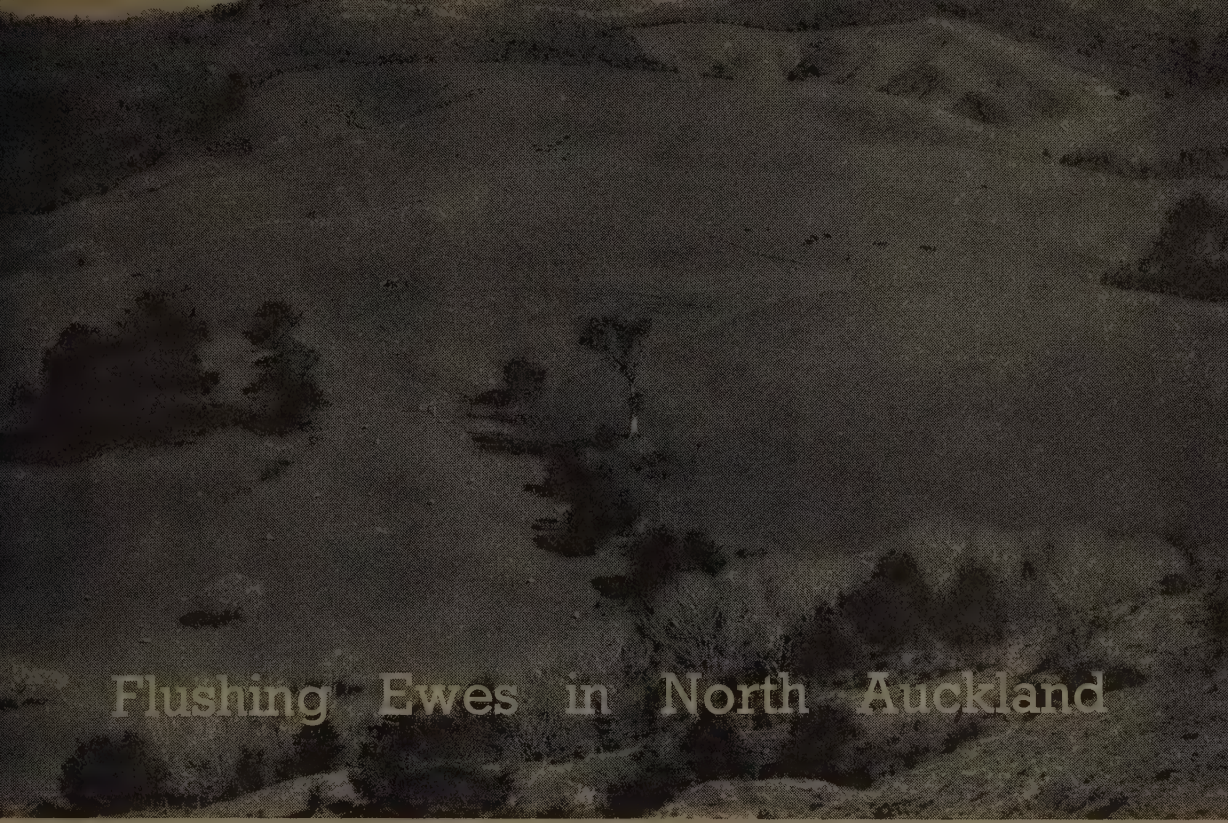
3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.



Flushing Ewes in North Auckland

By C. E. DALLINGER,

Instructor in Agriculture, Department of Agriculture, Whangarei

THE North Auckland Land District has increased its breeding ewes, according to agricultural and pastoral statistics, from 739,997 in 1947 to 884,740 in 1953, an increase of 144,743. This increase has been mainly in the southern counties of the district, and generally the counties which show the largest increase in breeding ewes have also the best lambing percentages. Seasonal fluctuations in lambing occur everywhere, and Northland, with its variation in soil and climate, is no exception, but the variations in lambing percentages, not only from district to district but between adjacent farms, show there is room for improvement in the present method of management by some alteration which need not be costly.

A HIGH lambing percentage is governed by a number of factors, but of these factors the one which most influences the percentage is the condition of the ewes at mating. Proof of this is seen throughout the country when drought conditions in autumn are followed by a reduction in the lambing percentage of 10 per cent. or more the following spring. The opposite result was seen in the 1953 lambing percentage, which was a record for the Dominion. In that year early autumn growth of pasture was extremely good in most districts and production in Northland in particular was a record.

Mating Condition of Ewes Important

The importance of having ewes in the right condition at mating is common knowledge and demonstrated both in good farm practice and by experiment. The practice of buying ewes from hard store sheep country and placing them on fat lamb country is based on the fact that a combination of better nutrition with ewes at their maximum fertility will produce an extra 25 per cent. of lambs. This applies equally to Merinos and half-breds as to Romneys and Border Leicesters.

HEADING PHOTOGRAPH: A scene near Pukapuka, Northland. Seasonal fluctuations in lambing occur everywhere, and Northland, with its variations in soil and climate, is no exception, but the variations in lambing percentages, not only from district to district but between adjacent farms, show there is room for improvement in the present method of management.

Canterbury Agricultural College, Lincoln, demonstrated some 25 years ago that ewes run on bare pasture and fed ½lb. of fowl wheat per day for 3 weeks before mating and 2 weeks after produced 25 per cent. more lambs than comparable ewes on bare pasture only. On today's prices for fowl wheat 25 extra lambs were produced for an outlay of £15 for 100 ewes.

The Department of Agriculture Ruakura Animal Research Station has demonstrated that early weaning and placing of ewes on a low plane of nutrition followed by flushing on saved pasture will produce an extra 20 per cent. of lambs. These trials have proved that the diet does not have to be succulent or high in protein to flush ewes.

Farm practice also bears out this point, since in mixed farming districts good lambing percentages are obtained where ewes are commonly flushed on second-growth rape or turnips and given the run of stubble and other paddocks.

In Northland the cropping for sheep is negligible and the variation in soil

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type and rainfall is considerable. Summer rains are extremely local and cultivation to obtain a good seed-bed and retain moisture for summer turnips should begin with discing the previous autumn.

Climate and Soil Factors

The east coast areas and districts farthest north generally have a drier autumn than such districts as Hokianga, and central districts are influenced by the Tutumoe Range, which increases the rainfall of the area considerably. There is also a large belt of soils derived from sandstone running down the west coast which dries out quickly, and until it is topdressed this country will grow only *serradella* and *Lotus angustissimus*. These annual legumes have an important disadvantage on sheep country. They seed and disappear in December-January and do not grow again until the late March-April rains germinate the seed. In addition many of the high-rainfall areas have a better natural soil fertility than the drier districts. There is more browntop and white clover and less danthonia and *Lotus angustissimus*.

In the dry, untopdressed areas the ewes are therefore existing on a diet of danthonia roughage of low feed value when the rams go out. This is commonly a dry period in Northland and the only green vegetation on the hills is paspalum. Unfortunately, paspalum does not spread quickly in dry, undeveloped country, and where the lower slopes and flats are topdressed they are frequently reserved for the weaned lambs and run cattle or for dairying.

These circumstances are the most important ones affecting Northland's low lambing percentages.

Production of Different Areas

The table below, taken from agricultural and pastoral statistics, shows the lambing percentages for the counties of the North Auckland Land District over 5 years.

There are considerable differences in the lambing percentages of the various counties, particularly when those of Mangonui, Whangaroa, and Great Barrier Island (where the seasonal variations have their largest effect) are contrasted with those of such counties as Franklin, Manukau, and Otamatea. The last three are obtaining good percentages because the pasture is improved with English grasses and paspalum and is topdressed. There is more fat lamb production in these counties with mature ewes to improve the lambing than in other counties which produce a greater proportion of store stock. But there is still considerable scope for improvement in those counties which commonly obtain an average lambing percentage of well under 90.

Northland's relatively low lambing percentage as compared with those of southern districts has been thought to be affected by higher temperatures and length of daylight. This effect on the lambing percentage has been tentatively put at about 5 to 6 per cent. in favour of Southland, which has a relatively high lambing percentage. This may be a factor, but it is a small one compared with the variation in lambing percentages between Franklin and the more northern counties where a difference of 20 per cent. or greater cannot be due only to a difference in light and temperature between the districts.

Proof of this is shown by the fact that in any district in Northland there are farmers who consistently obtain a lambing percentage of 95 or better under extensive conditions and with good-sized flocks while other men with medium-sized flocks regularly obtain a lambing percentage of 100 or better.

Pasture Improvement

The way to improve the situation lies entirely in pasture improvement, topdressing, and treatment of the ewe flock before mating, for though cropping could be a means of improvement, the trend toward permanent pasture in Northland makes cropping only a passing phase in land development. Farmers who are developing land and whose pastures do not yet contain a good proportion of paspalum would find a marked improvement in their lambing if they made a practice of cropping 5 to 10 acres of soft turnips for flushing a flock of 500 to 1000 ewes.

The turnips can be sown with paspalum in November-December, the turnips fed off, and English grasses oversown in autumn.

The alternative to cropping for flushing ewes is the improvement of Northland's pastures, which must include paspalum, except in the cool and high-rainfall Tutumoe district. In the drier localities paspalum does not spread rapidly on the hills, especially since much of the hill country is not topdressed. Aerial topdressing is, however, increasing rapidly. This will improve the white clover, which, with better stocking, will encourage the spread of paspalum.

Where cultivation is possible the worn-out danthonia pasture should be regrassed by being worked down to a seed-bed in spring and by the sowing of 5lb. to 10lb. of paspalum per acre in October-December. Paspalum sown alone germinates readily at this period and by autumn will be 5 years ahead of the result obtained by sowing it in autumn with a mixture of other grasses and clovers.

In the higher-rainfall localities, such as Hokianga and the strong volcanic country, the natural fertility is high enough for paspalum to be dominant already, and white clover and *Lotus uliginosus* (*major*) are present. The pasture in these areas can be quickly improved by topdressing and increasing the run cattle to control the rapid growth of paspalum.

Flock Management

With the improvement in pasture must go a programme of management of the ewe flock. Early weaning (3 to 4 weeks earlier than usual) is essential. This is not a new practice and is often done in a dry season to prevent the ewes from robbing the lambs of the best pasture. The weaned ewes should then be concentrated on a bare paddock to keep down their condition, but the old rule of keeping them in a paddock until they "eat the battens on the fence" is perhaps severe. Keeping the weaned ewes on a short diet gives the lambs a better choice and allows an area to be saved for flushing the ewes.

It is at this stage that paspalum becomes so valuable in Northland and the farther north it is the more important it is, particularly in the drier east coast areas. Without paspalum the pasture in February-March is at its worst in quantity and quality. Without a sufficient area of topdressed country for both ewes and hoggets, the hoggets are given the best and the ewes are run on unimproved country before and during mating. They should run on improved pasture for 3 weeks before and at least 2 weeks after mating. This method, or the alternative of providing some crop for flushing the ewes, is essential for improving Northland's lambing percentage.

LAMBING PERCENTAGES

County	1947	1948	1949	1950	1951
Mangonui	78.4	80.7	79.3	81.3	87.7
Whangaroa	81.3	73.8	88.0	72.2	78.9
Hokianga	91.4	92.4	80.3	81.3	79.6
Bay of Islands	90.6	88.8	93.1	92.2	90.3
Whangarei	87.1	87.1	89.7	83.2	90.4
Hobson	81.6	79.2	80.4	78.5	80.1
Otamatea	93.2	95.9	102.2	97.6	102.1
Rodney	86.1	86.2	86.0	92.2	91.6
Waitemata	88.3	90.5	89.2	95.0	99.4
Great Barrier Island	71.3	75.1	66.1	57.5	60.4
Manukau	106.6	101.0	105.0	102.0	100.3
Franklin	122.7	112.5	106.0	105.3	105.7
Average for North Auckland	93.8	92.4	92.8	92.2	94.2
Average excluding Manukau and Franklin	87.2	87.5	88.5	88.1	90.9

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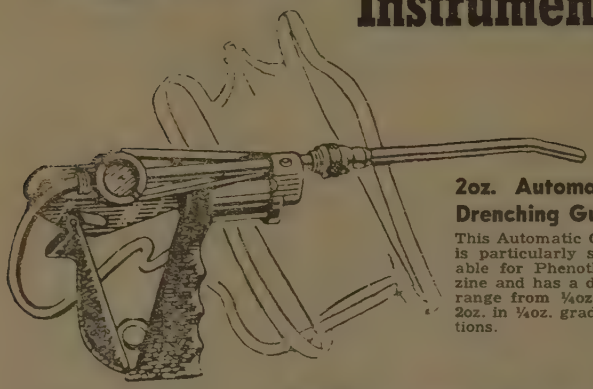

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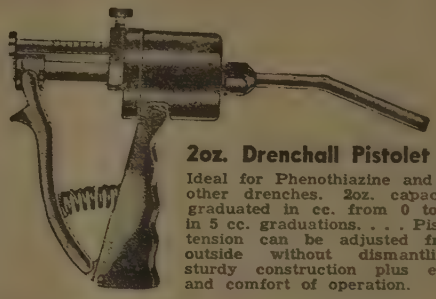

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3.5

FAO Reviews the Post-war Decade

"The State of Food and Agriculture", 1955

FAO'S annual publication, "The State of Food and Agriculture" for 1955 reviews in some detail the progress made in agriculture since the end of the war. As FAO has now completed 10 years' work in this field, this report on world resources of food and primary production appropriately covers the entire post-war decade.

THE report is in two parts; Part 1 reviews changes in the pattern of production, consumption, and trade in food and agricultural products in the post-war decade. It begins with a summary of the world situation immediately after the war and then examines aspects such as progress in technology, price movements, and policies which have been responsible for progress in the following 10 years. Part 2 reviews individual commodities in detail and incorporates a short-term estimate of likely trends. This part covers a wide variety of commodities, but the most important to New Zealand are the sections dealing with meat, dairy products, and wool.

The summary which follows deals more particularly with Part 1 of the report.

During the war world population increased by 10 per cent. and agricultural production by only 5 per cent. These rates of increase, however, were not uniform throughout the world. In North America, for example, agricultural production expanded by 32 per cent., which, on a per-head basis, was an increase of 18 per cent.; Far Eastern countries (excluding China) suffered a 10 per cent. decrease in production, which, per head, was a 22 per cent. decrease. This was due to the tremendous population increase in Far Eastern countries, some 100 million compared with about 20 million in North American countries.

World Production Higher

The United States especially took advantage of this more favourable position and expanded agricultural production enormously in the 10 years after the war. Pre-war production in the poorer countries was already low per head of population and this and war damage made recovery slow. However, as a result of various economic, social, and technical measures adopted world production in 1954, including tentative estimates for the Communist countries, was some 30 per cent. greater than in 1946-47 and some 20 per cent. greater than before the war.

Efforts to increase food production in the early post-war years are reflected especially in the food exports of North America, which were maintained at three to four times their pre-war level until 1952, when the recovery of production elsewhere caused them to decline. Production, however, has continued to expand, with the result that surplus stocks of wheat, cotton, sugar, wool, and dairy products have accumulated. The continued low level of food consumption in some regions which have low purchasing power and the surpluses in others have been the main features of more recent years.

Recovery and Expansion

Recovery and expansion of agriculture were made possible to a certain extent by the use of better technical methods. In the industrialised countries these methods were directed principally toward increasing productivity per man and per acre by the adoption of better techniques; in the less-developed countries the emphasis was on extending the area cultivated by better use of land and water resources. These technical measures consisted of improved standards of farm management, a more liberal use of fertilisers, and further development of irrigation and plant protection techniques.

The development of national extension services also played a large part in helping to increase productivity in the less-developed regions. To provide for this technical development, planning was necessary to supply capital for agricultural investment and to allocate limited resources between agriculture and industry. To further stimulate production assured outlets at remunerative prices were necessary for any additional quantities produced; hence the widespread use in some countries of price support schemes. Such schemes gave a stability and confidence to farming never before enjoyed and though they were partly responsible for the later accumulation of surplus stocks, they have also been a major factor in preventing effects similar to conditions after the First World War, when there was not the same measure of control.

In the United States, where the price support system is used most, there has been criticism that limiting support to certain commodities, among them wheat, cotton, and dairy products, has directed production away from other products, for example, meat, for which demand is increasing. Attempts to overcome this have been made in the United Kingdom and Sweden by supporting farm incomes as a whole rather than prices of individual products. The system has also been criticised as costly and tending to favour high costs of production. One method used to overcome this has been the subsidising of certain farm requisites.

The various schemes of price support adopted in producing countries were originally designed to stimulate production and have been retained for that purpose.

A system of price incentives is not always adequate for small farmers and it was in countries of small farmers that increase in agricultural production was most necessary. Therefore less expensive and more effective methods were sought which primarily took the form of direct inducements to farmers; for example, improvement of credit facilities and subsidising such requisites as fertilisers and machinery.

It has become increasingly necessary in later years to expand production more selectively; that is, of products for which there is an effective demand. FAO is at present organising such a programme on a regional basis. This scheme is designed to maintain the rate of agricultural expansion, but on a more selective basis, at the same time with the aim of improving food consumption.

Improvements in Marketing

As production increased and the acute shortages of the immediate post-war period were overcome attention was turned to problems of marketing associated with the changed world situation. Efficiency in marketing can help maintain farm incomes, at the same time allowing for a general reduction in relative agricultural prices. One way of doing this has been the development of co-operatives, especially in the under-developed countries.

The volume of world agricultural trade in 1946 was estimated to have been some 20 per cent. less than before the war. Apart from this the pattern has also changed. Agricultural exports from North America increased enormously, whereas in Europe and the Far East they fell appreciably while in Australia and New Zealand there was a continued upward trend.

The significant feature of world trade as a whole since the war has been the relative stagnation in agricultural trade. There has been a decline of about 20 per cent. to 15 per cent. in the volume of agricultural trade in total international trade. For all this, patterns of trade in Australia

and New Zealand have retained their previous form, whereas in North America the export of agricultural products has expanded and in Europe and the Far East it has contracted. This reflects a greater degree of self-sufficiency in agricultural products and, especially, the low purchasing power of the importing countries.

Present Situation

As a result of the efforts in expanding agricultural production per-capita production on a world basis is now a little above the pre-war average. However, great as this achievement is, world output from industry increased about twice as fast as output from agriculture in the post-war decade.

Per-capita food consumption remains inadequate in many of the underdeveloped regions and though there are variations between countries, the nutritional level in all regions except Latin America has shown a fall on pre-war levels. This has been due to the failure of food production to keep pace with growth in population and in the advanced countries changes in consumers' preferences.

The low levels of food consumption of about two-thirds of the world's population are the result of low purchasing power. Surplus stocks of certain agricultural products have accumulated and the present problem initially is to sell these products to countries which need them at prices they can afford without wholly disorganising normal trade. At the same time population is increasing by some 30 million each year so that there is still a strong need to continue to expand food and agricultural production.

The whole problem of inadequate purchasing power on one hand and production beyond the immediate needs of the market is considered to be one for the Economic and Social Council of the United Nations rather than for FAO, but FAO is endeavouring to raise consumption levels by education in nutrition, inauguration of special schemes to feed special groups of consumers, such as mothers and children, and initiation of measures to reduce the cost of food to consumers as a whole.

At the end of this post-war decade many of the original problems of low food consumption levels, poor farm incomes, etc., still exist to the degree they did immediately before the war. However, recovery from wartime upheaval has been brought about and countries now are planning, with the help of FAO, for longer-term problems of increasing production to meet the needs of the ever-growing population and at the same time endeavouring to improve nutritional standards. This situation applies to over half the world's peoples.

Development of Reverted Land on West Coast of South Island

By J. SHEPHERD, Fields Instructor, Department of Agriculture, Greymouth

MOST of the terrace areas of the west coast of the South Island where native bush has been felled for timber have reverted to second growth, gorse predominating. However, much of the land of the Ahaura series of soils can be developed economically for farming whether timber is present or not.

IT has been proved that the principle of development must be "into grass by the most efficient and quickest methods". Where there is no timber giant discs are put straight into the standing gorse, crushing and breaking it down in one operation. A heavy agricultural tracklaying tractor is used and the area is double cut. After the giant discing the area is worked down to as good a seed-bed as possible with tandem discs and harrows. Little or no time is spent picking up gorse sticks and seldom is any burning done.

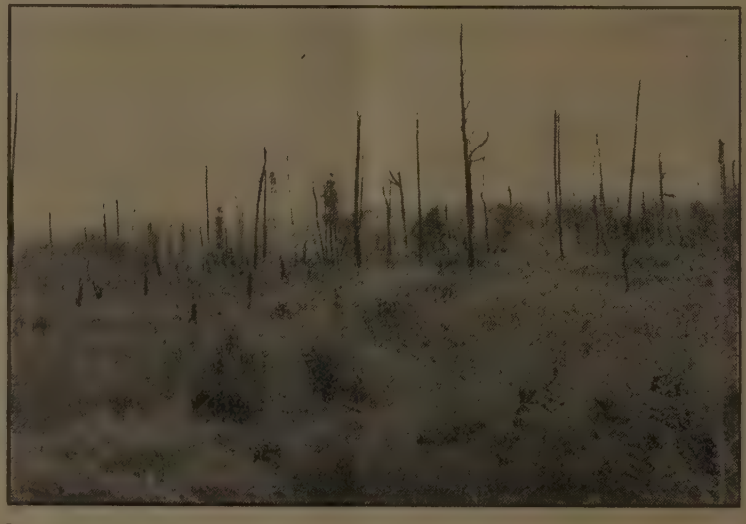
Liming is essential, as the soil is very acid; an initial dressing of 2 tons to the acre is desirable, followed by dressings to requirements. The phosphate levels of these Ahaura soils are not high and applications of up to 4cwt. of superphosphate per acre are required.

The first sowing is to turnips or grass or both of these as circumstances dictate. Turnip areas after being fed off are disced (or if not too stony, ploughed), worked down, and sown to permanent grass. Areas first sown to pasture do not last more than 2 to 3 years. After that time they are reworked, sown to roots, and then into permanent pasture. Gorse regrowth is ignored, and provided fire has not been used, it is surprising what little regrowth there is, especially where sheep are used for grazing.

Where beech timber is present the cost of land development is considerably higher—about another £8 to £10 per acre. Timber is windrowed with a bulldozer, the soil being disturbed as little as possible. Country on which there is still timber usually has a greater depth of topsoil than that with a purely secondary-growth cover and for that reason can be ploughed instead of being giant disced, provided there is not much gorse.

Subsequent treatment is similar to that already described for development with giant discs, but as turnips as a first crop have proved a failure, the present practice is to sow to temporary pasture for 12 months to 2 years and to rework for turnips. Quite good crops can be grown by this method, and when permanent grass is sown fairly good pastures are obtained.

Development by the methods described has yielded very worthwhile increases in production and income.



Reverted terrace lands on the west coast of the South Island. After the timber was cut many of these areas reverted to second growth.

Use of Antibiotics on Sheep Farms

THE advent of penicillin after the discoveries of the late Sir William Fleming placed a new and valuable weapon in the hands of the veterinarian and the stock owner, a weapon which if used intelligently could be of great assistance, but antibiotics were not a panacea for all stock ills, they could help only in a limited way, and they could never take the place of sound farming practice. These were the principal points in a paper, an adaptation of which follows, at the Ruakura Farmers' Conference last year in which D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton, made recommendations regarding the use of antibiotics available to sheep farmers.

UNFORTUNATELY penicillin has become almost a household word, a position engendered by widespread publicity sometimes greater than the known facts would warrant, and the value of this and the other antibiotics has been inflated, giving rise to the misconception that practically any disease will yield in the most dramatic fashion to antibiotic treatment; but nothing could be further from the truth. This is particularly so with many of the stubborn, widespread conditions which are seldom spectacular in their manifestations and usually require tedious work, attention to adequate hygiene, and good husbandry in the form of routine inspection and treatment or strict adherence to a vaccination programme.

Farmers and veterinarians would be more than human if they did not indulge in some wishful thinking and hope for a panacea for all stock ills, but antibiotics can help only in a limited way and can never take the place of sound farming practice. Another drawback to the use of antibiotics is one caused by their marked effect on susceptible infections, which are so rapidly and completely eradicated that no antibodies are produced by the animal attacked and no specific immunity is acquired, leaving the animal open to further attacks by the same or similar organisms. Vaccination is advised after a successful cure in appropriate infections.

It is an interesting fact that when penicillin is injected into the body of an animal for the treatment of localised injury or infection the drug persists longer in the inflamed tissues than in the circulation. This is, of course, fortunate.

On the other hand, too gloomy a picture should not be presented, and examination of the antibiotics available to sheep farmers and the use they can make of them is worth while.

Injecting Penicillin

Penicillin is available in collapsible tubes, the tube nozzle being designed to fit a record type hypodermic needle which is supplied with each tin of tubes. This makes a convenient syringe for use in the field that can be used once and the tube discarded. The needle is plunged directly into the thick muscle at the back of the hind leg of the sheep, the tube attached, and the contents squeezed into the muscle. No harm will be done if the penicillin is put under the skin, but the muscle is the best place for it.

This penicillin is a mixture of a quick-acting type and another form which is released into the blood more slowly and is effective for 24 hours, so that any repeat injections required need be repeated only daily. The daily dose for a lamb is 100,000 units and for a ewe 500,000 units; for a cattle beast or horse 1½ million units is the minimum adequate dose, and the collapsible tubes are sold in these strengths.

Blood Poisoning

On a property where blood poisoning is known or suspected to be present penicillin can save the lives of many sheep. This infection lives in the form of dried spores in the soil of many older pastures and round permanent yards. These spores can be picked up by mouth and lodge in the muscles of the animal, where they remain dormant until some bruising or damage to the muscle may bring on the disease after such operations as dipping, shearing, crutching, lambing, and mustering. The spores can also be picked up directly from the soil by wound contamination; such infections can arise from navel infections in new-born lambs, in rams after fighting, and from wounds inflicted during shearing, dipping, lambing, lamb marking, and other operations.

Where a ewe has to be assisted to lamb or where obvious damage is caused in any other way, such as a dog bite, a single tube of 500,000 units will kill any blood poisoning infection. This method would be of greatest value where early lambing ewes which had had to be assisted had died from blood poisoning; then penicillin could be used on all other cases requiring handling. Penicillin is, however, only an emergency measure, as vaccination of all ewes at least 3 weeks before lambing will protect them for the rest of their lives, except where infection is very severe, and will protect their lambs for about 6 weeks, which is long enough for them to be docked and castrated with safety. Ewe lambs require vaccinating when 2-tooths some time between tupping and 3 weeks before lambing.

[*Niederer*

D. W. Caldwell: Antibiotics a valuable weapon in maintenance of health in animals, but not a panacea.

On about 10 per cent. of all infected farms a mixed infection is found in blood poisoning cases, with another germ of the same family in association with the one commonly uncovered, but penicillin is active against both and a mixed vaccine is available. Such a mixed vaccine would be used only where the double infection had been diagnosed by the laboratory.

The important point is that penicillin is useful as a preventive only where exposure to infection is suspected or in the very early stages of infection by organisms of the *Clostridium* family. These are responsible for blood poisoning in sheep, blackleg in cattle, malignant oedema, pulpy kidney, black disease, and tetanus, as these germs multiply rapidly and produce a toxin which is responsible for acute illness and rapid death, and once a lethal dose of toxin is in the circulation reduction in the number of germs present will not save the animal.

Arthritis

Arthritis in newly born lambs can be troublesome, but affected lambs quickly recover after receiving one or two injections of 100,000 units of penicillin. Such lambs are obviously lame, usually in one leg only, and examination will reveal a hot and painful joint which may be swollen. Early treatment is advisable before permanent damage to the smooth surfaces of the joint occurs, causing prolonged lameness and partial condemnation at the meatworks at slaughter.

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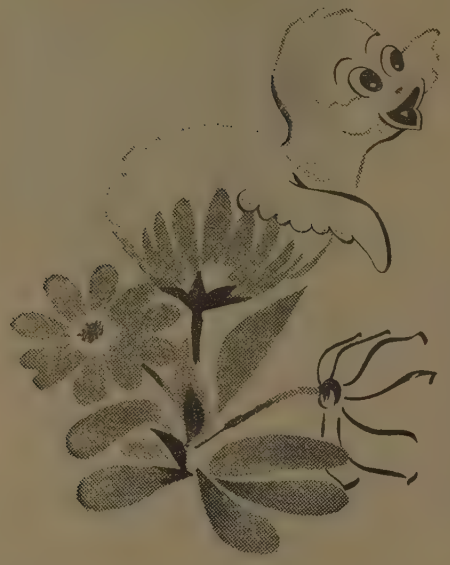

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Foot Troubles

A great deal of research work has been done to determine the effectiveness of antibiotics in treating foot-rot in sheep, but in spite of the reported good results with the use of 10 per cent. chloromycetin in methylated spirit applied to the foot with a brush, the findings of three small trials carried out at Ruakura suggested that the treatment was no more effective than the older method of using formalin solution in a foot-rot bath. There is no substitute for thorough paring of diseased feet to expose all affected tissue; the value of any application is only as good as the preparation of the foot with secateurs and knife. Use of penicillin by injection is of doubtful value and is not recommended.

Foot abscess, which breaks out occasionally in a few sheep in a flock, can be treated with penicillin, but the abscess once formed within the foot will benefit more from opening and draining.

Infections in New Lambs and Ewes

Many new-born lambs may get navel infection with germs other than the toxin producing blood poisoning organisms and where such an infection is noticed the injection of the appropriate dose of penicillin will often prove beneficial. A sick or weakly lamb usually means there is something wrong with the ewe, very often her udder.

Chloromycetin solution injected daily for 4 days into the udder of a ewe suffering from "black udder", an acute mastitis, is reported to have produced rapid improvement in the general symptoms, and, provided the disease is treated early, the affected udder can be saved. This is only of academic importance, as "black udder" seldom affects more than a few ewes and under anything but a very close system of shepherding the mastitis would not be noticed until the disease was well advanced and at least one quarter destroyed. The ewe, if she recovers, should be marked for culling.

Pink Eye

Another and more practical use of chloromycetin is in the treatment of pink eye, which is often seen in sheep that have travelled in mobs or are being held in paddocks during periods of danger from facial eczema. Daily use of chloromycetin eye ointment is an excellent treatment, but such use would be confined to valuable stud sheep because of the expense of the treatment and the labour involved.

Treatment of Run Cattle

In run cattle the injection of 1½ million units of penicillin for foul in the foot is usually effective and may be preferred by some owners as being easier to inject than a 100 c.c. bottle of sulphamezathine, which is also an excellent treatment.

In woody tongue and lumpy jaw infections in cattle penicillin has been found to be reasonably effective, particularly when injected round the site of the infection, but the injection of 1oz. of sodium iodide is to be preferred and better results will be gained by its use.

Hacks and dogs on sheep farms sometimes get cut or torn on tree stumps, barbed wire, or other projections, or dogs bail up a wild pig and get slashed. Penicillin from the handy little tube smeared into the wound will assist healing and keep infection to a minimum. This is particularly useful where a dog has to be stitched.

☆

Spray Irrigation Aids Pasture Establishment on Sand Country

By A. A. DUNCAN,

Instructor in Agriculture, Department of Agriculture, Wanganui

THE establishment of pastures on the lighter sand country of the west coast of the North Island is at best a difficult task because of the ever-present possibility of sand blows. A serious sand blow is not only capable of removing all the seed off the paddock, but it can also bury fences and useful pasture. The two factors responsible for sand blows are dry conditions and strong winds, and if the sand is very dry, the winds do not have to be particularly strong. These two factors are liable to operate at any time of the year, though their incidence is less in autumn and winter.

The March/April period of last autumn was very dry and not at all suitable for pasture establishment on sand country. In order to continue with his grassing down programme in spite of the dry weather, Mr. N. W. Parsons of Waitotara decided to sow the grass and then experiment with spray irrigation. The ground was given 1in. of water immediately after sowing and then 1in. every 7 days until about 4 weeks later, when rain fell. During this 4-week establishment period no rain fell and there were odd days when the wind was strong enough to move the sand had it not been irrigated. The paddock was sown down on 18 March and the first rain fell on 17 April.

Newly sown sand country pasture being spray irrigated.

Apart from supplying the much-needed moisture the spray irrigation aided consolidation, because wet sand packs better than dry sand. It also enabled better use to be made of the roller. Dry sand is difficult to consolidate, because it gives way when any weight is applied to it and the tractor and roller are inclined to cultivate it rather than make it firmer. It was found that rolling about 24 hours after irrigation was the most suitable time; rolling any sooner than this resulted in the sand sticking to the roller.

The spray irrigation plant that was used had a capacity of applying 1in. of water to an acre in 3 hours. Thus in a 15-hour day, which was about the maximum practical period to irrigate, 5 acres could be watered. The area was irrigated on the day of sowing to avoid any possibility of wind damage.

Establishment of the pasture in this case was very satisfactory and illustrates that spray irrigation has a place on newly sown grass on sand country in dry autumns in those locations where water is available.

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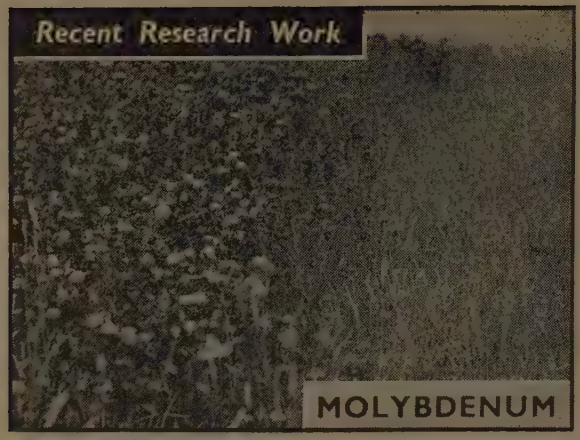


DETAILED studies of the interaction of soil acidity (pH), liming history, and molybdenum responses are being made by pasture measurement trials in Otago and Southland, at the Department of Agriculture's Invermay Agricultural and Winchmore Irrigation Research Stations and at the Department's Marton Experimental Area, but the survey of soil types for molybdenum responses involves about 600 observational trials on pasture and lucerne.

RESPONSIVE SOILS

Many molybdenum-responsive soil types have been found. The largest area of highly responsive soils occurs in the South Island among the damp and wet coastal yellow-grey earths of the Balclutha-Gore, Taieri, North Otago, and South Canterbury districts. These are soil types of the downs country of low original fertility. Pastures on much hill and undulating country formed from sandstone in Rodney County in Northland and certain soils north of Auckland derived from andesitic or doleritic rock are also very responsive to molybdenum applications. The last-mentioned soils require much lime and do not respond to superphosphate without previous liming.

Many other soil types are known or suspected to be molybdenum deficient as far as pasture and lucerne growth is concerned. On some soils only a slight deficiency exists, and though lucerne responds well to molybdenum, responses are rare and small on pasture. Among such soils are the dry coastal yellow-grey earths (the fertile downs soils of North Otago and South Canterbury) and a number of soils of the Canterbury and Wairau Plains. Hill soils derived from greywacke and associated sedimentary rocks have responded to molybdenum in the Marlborough Sounds, the Wellington area, and north of Auckland.

CANTERBURY TRIALS

Sixteen trials have been laid down on the Canterbury Plains on soil types representative of the area between the Waimakariri and Rakaia Rivers. In only 3 of the trials was there any response to molybdenum. Two of these were on Lismore soil types, one trial giving a good response and the other a very slight response. The third trial, on a Ruapuna soil type, gave a good response to molybdenum in one set of plots, but the duplicate plots on a lower terrace in the same paddock gave no response. Another trial on a similar soil type gave no response. In 11 of these 16 trials lime plus superphosphate gave increased responses over superphosphate alone. In general it seems that appreciable responses to molybdenum on pasture in this area are most likely to be obtained on the lighter soils which have had little or no lime.

A complication in the use of molybdenum on these soils is that the Lismore soils have been found to produce pastures of low copper content. This is described by I. J. Cunningham, Superintendent of the Department of Agriculture's Animal Research Station, Wallaceville, in his article, "Molybdate Topdressing and Animal Health" on page 196 of the February 1955 "Journal". Hence molybdenum on these soils should be used cautiously and copper fertilisers should be used in conjunction with molybdenum.

Three trials have been laid down on the low foothill country between Springfield and Windwhistle. Only on 1 trial was a response recorded and it was 2 years before this slight response was apparent.

Seven trials have been laid down on high, tussock grassland areas of the Waimakariri watershed; 5 trials were on Tasman soils and 2 on Kaikoura soils. One trial on a Tasman soil gave a very good to excellent response, 1 a slight response, 2 gave no response, and the fifth trial was unsatisfactory. One of the 2 trials on Kaikoura soils gave a fair to good response and the other trial was unsatisfactory. It is possible that in some of the trials on the Tasman soils, at least, the tight browntop sward has prevented the growth of the clovers and so masked possible molybdenum responses.

—D. JOHNS

* * * *

WELLINGTON TRIALS

ON the hills directly to the east of Shannon, Levin, and Otaki, on Paraparaumu hill areas, and in the Pauatahanui-Judgeford district responses to molybdenum in the stimulation and increase of white and subterranean clover and annual trefoil species have in some cases been outstanding. These observation trials indicate that the application of molybdenum on the hill areas of the western Wellington district will play an important part in the improvement of hill country pastures in the major farming areas. Already the influence of these trials on topdressing programmes is apparent, and several farmers in the Pauatahanui and Paraparaumu hill areas have applied molybdenum superphosphate by air during the present season.

The good responses to basic slag on Wellington hill country suggest that the small amount of molybdenum in basic slag may have been a contributing factor to the deep green, vigorous clover obtained by continuous applications of this fertiliser. Where comparisons are made between superphosphate, serpentine superphosphate, and basic slag in initial applications to hill country the response to basic slag has been the most outstanding in the increase and vigour of clover species. However, molybdenum, though increasing the response to slag, improves responses to superphosphate and to serpentine superphosphate.

—J. M. HOPKINS

* * * *

WARKWORTH TRIALS

A number of experiments with molybdenum applications to pasture have been carried out in the Warkworth district. Out of 11 trials 5 have given good to excellent responses, 4 slight to fair, and 2 did not respond at all. All the experiments have been carried out on soils of the Puhoi suite, which includes most of the soils derived from sandstone in Rodney County. It now appears that all the soils derived from this sandstone are inherently deficient in available molybdenum but that topdressing can affect the uptake of this element by plants. The two trials which failed to show a response were the only ones which had previously been topdressed with basic slag; 1 had received 7cwt. of basic slag and 1 ton of lime per acre, and the other 3cwt. of basic slag and 2 tons of lime per acre. In another experiment molybdenum was applied, and a response obtained on pasture which had been limed at 3 tons per acre but which had received no basic slag. The molybdenum was applied at 2½oz. per acre in all trials except 4 on Dome Valley soils, which gave responses to applications of 1oz. per acre.

In all instances the molybdenum response has been in the form of increased clover and in palatability. In some instances molybdenum without any other form of topdressing has produced a sward strong in clovers where no clovers previously existed. One trial begun in August 1950 was still showing a response 3 years later, though it appeared to be declining.

—C. M. BLICK

Heading photograph by Robertson.

Ways of using —

PLUMS

OF the stone fruits grown in New Zealand plums are probably the hardiest and those most frequently found in small home orchards, where in favourable years avoiding waste with heavy crops may be a problem. In this article by Evelyn E. Moore, Field Officer in Rural Sociology, Department of Agriculture, Palmerston North, are recipes for using plums in puddings and cold desserts, and in sauces, pickles, and chutney, which are good ways of using heavy cropping but poorly flavoured plums. Methods of preserving plums are described briefly and recipes for using plums in jams and jellies are also included.

THOUGH many housewives may be in the position of having to make the best use possible of the variety or varieties of plums they have available, others or those purchasing plums for bottling and jam have more choice and may find the following suggestions regarding varieties of some use.

English plums, which include cherry plums (ripening in early January), greengages (early February), diamond (mid-February), and Cambridge gage (late February), are generally sweeter and more mildly flavoured than Japanese varieties, and though they are not entirely freestone, most of them can be stoned easily if required. Cherry plums, greengages, and Cambridge gages are particularly good plums for preserving, as they may be easily and economically packed into jars, keep their shape well, and retain a good flavour.

Damsons (occasionally available) are not good eating or preserving plums but make excellent jam, particularly if the fruit is sieved after being cooked and before the sugar is added.

Good varieties of Japanese plums include Wright's Early (a red-skinned, yellow-fleshed plum ripening in late December), Santa Rosa (an egg-shaped plum excellent for dessert or for use in fresh fruit salads and ripening in early January), Satsuma (a blood-red, clingstone plum ready in mid-January), and the late plums Doris (a red-skinned, yellow-fleshed clingstone plum), and Omega (also called George Wilson or Mikado). Doris and Omega are both all-purpose plums, but the latter, a freestone plum, is less sour and more useful for preserving.

Many varieties of Japanese plums tend to develop a sour, almost bitter flavour when cooked or preserved, though if they are used in jams, jelly, or chutneys and sauces, they probably give a better-flavoured product than do some of the milder-flavoured English plums.

However, though both Japanese and English plums grow equally well in the South Island, English varieties do not grow well in many parts of the North Island, and planting of Japanese varieties is to be preferred in these areas.

All the measurements given in the following recipes are level.

Desserts

Though many may tend to regard plums as one of the less attractive dessert fruits, the better-flavoured varieties can be used in a great many ways such as either raw or cooked in fruit salads, jellies, fruit whips, or other cold sweets or cooked in pies, sponge puddings, or instead of apples in steamed apple pudding.

In the following recipes any good dessert plum such as Doris, Omega, greengage (though the colour may not be so attractive), or Satsuma may be used.

Plum Mould

1lb. of plums
2oz. to 4oz. of sugar
1oz. of gelatine
1 tablespoon of sherry
2oz. of coarsely chopped nuts (preferably almonds)
Whipped cream

Some of the many uses to which plums can be put.

Stew the plums in a syrup of the sugar and ½ pint of water until they are tender. Strain off ½ pint of the juice, dissolve the gelatine in it, and add the sherry. Pour a little of the jelly into the bottom of a mould. When it is firm decorate it with a few split almonds, sliced bananas, or other decoration and put another layer of jelly over these. Meanwhile, sieve the plums, add some of the coarsely chopped nuts, and mix in the rest of the jelly. Pour the mixture into the decorated mould and leave it to set. When it is firm turn it on to a plate, decorate it with whipped cream or crystallised cherries, and serve. 4 servings.

Plum Cream

½oz. of gelatine
½ cup of plum juice
1 cup of stewed and sieved plums (unsweetened)
¼ teaspoon of salt
¼ cup of sugar
1 cup of whipped cream or
½ cup of whipped cream and ½ cup of made custard

Prepare a jelly mould, add the salt, sugar, and gelatine (and colouring if desired) to the plum juice, and stir over gentle heat until the sugar and gelatine have dissolved. Pour into the stewed and sieved plums, stirring well. When the mixture is cold fold in the whipped cream (and custard if used), put the mixture into a mould, and leave it to set. 4 to 6 servings.

Plum Meringue Pie

Pie Crust

6oz. of flour
¼ teaspoon of salt
3½oz. of butter
1 teaspoon of sugar
1 egg yolk
Cold water to mix

Sift the flour and salt, rub in the butter, add the sugar and lightly beaten egg yolk, and mix to the consistency of a stiff dough with cold water. Knead the mixture together lightly on a floured board and roll it out into a circle ¼in. thick to fit the tin it is to be baked in. Ease the pastry into the tin, pressing it flat at the base and around the sides. Put in a piece of grease-proof paper and some dried beans and bake it in a hot oven for 15 minutes. Remove the filling and cook a further 10 minutes, then cool on a rack and add cherry plum filling.

Cherry Plum Filling

4 cups of plums
¼ cup of cornflour
1½ cups of sugar
1 teaspoon of almond flavouring

Stone and cook the plums in 1 cup of water. Combine the sugar and cornflour, mix with a little water, and add to the hot plums. Cook until thick, stirring continuously. Remove from the heat and add the flavouring. Cool slightly and pour into a baked pie shell. Cool.

Serve cold or warm topped with the following meringue.

Meringue

3 egg whites
¼ cup of sugar
¼ teaspoon of cream of tartar

Beat the egg whites until they are just stiff with the cream of tartar. Beat in the sugar until the mixture is thick and glossy. Pile on to the plum mixture and brown lightly in a moderate oven.

Alternatively stew the plums gently in a medium syrup. Strain off the syrup and again bring it to the boil. Add 1 teaspoon of arrowroot mixed with 2 teaspoons of red currant jelly or apricot jam. Boil the mixture until thick. Arrange the plums in the pie crust and pour the thickened syrup over them. Serve cold.

Plum Upside-down Cake

Cake Mixture

2oz. of butter
¼ cup of sugar
1 egg well beaten
¼ cup of milk
1½ cups of flour
2 teaspoons of baking powder
½ teaspoon of salt

Cream the butter and sugar and beat in the egg. Sift the dry ingredients and add alternately with the milk to the creamed mixture.

Upside-down Mixture

3 tablespoons of butter
½ cup of sugar
¼ teaspoon of salt
½ teaspoon of cinnamon
2 cups of plums

Cream the butter, sugar, salt, and cinnamon together and spread on the bottom of a cake pan approximately 8in. x 8in. Arrange stoned half plums, either fresh or preserved, on top close together on the mixture. Pour in the cake batter. Bake in a moderate oven (350 degrees F.). Turn out on to a plate and serve fruit side up. 6 servings.

Plum Kuchen

1lb. (approximately) of stoned plums, halved
1 cup of flour
1 teaspoon of baking powder
½ teaspoon of salt
¼ cup of milk
½ teaspoon of vanilla
3 tablespoons of melted butter
1 egg
¼ cup of sugar
¼ cup of fruit juice
¼ cup of sugar mixed with 1 teaspoon of cinnamon
½ teaspoon of lemon essence

Optional

¼ cup of cream
1 egg

Beat the egg and add the sugar while beating. Add the flour sifted with the salt and baking powder and then add the milk, melted butter, and flavourings. Pour into a shallow pan about 7in. x 10in. Arrange the stoned halved

plums close together over the surface. Sprinkle with the juice, sugar, and cinnamon, and if desired beat the additional egg and pour it and the cream over the top. Bake for approximately 25 minutes in a moderate oven (350 degrees F.). Cut in squares and serve. 6 to 8 servings.

Individual Purple Plum Puddings

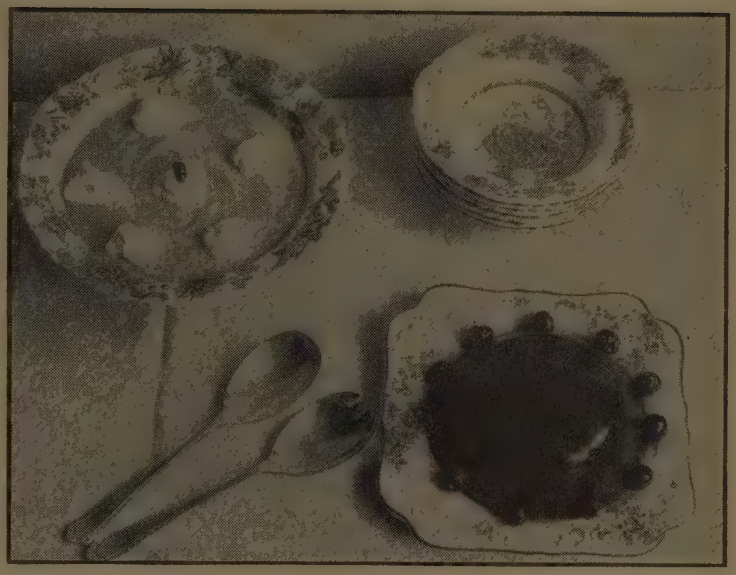
2lb. of stewed plums or 1 quart bottle of plums (purple or dark fleshed)
3 teaspoons of baking powder
2 cups of sifted flour
½ teaspoon of salt
2 tablespoons of sugar
2oz. of butter or other shortening
1 cup of milk

Drain and stone the plums and reserve the juice. Sift together the dry ingredients and rub or cut in the butter. Add the milk and stir only until the flour is mixed in. Place about 2 tablespoons of dough in the bottom of each of 8 well-greased custard cups. Cover with a layer of fruit and then the remaining dough. Cover the cups tightly with waxed paper, place in a large covered baking dish containing 1in. of boiling water, cover, and steam in a moderate oven (350 degrees F.) for 45 minutes. Serve hot with plum sauce.

Plum Sauce

2 tablespoons of cornflour
¼ cup of sugar
1 teaspoon of cinnamon
1 tablespoon of butter
1 teaspoon of lemon juice
1½ cups (approximately) of juice drained from stewed or bottled plums

Mix cornflour, sugar, and cinnamon in a saucepan. Slowly stir in the fruit juice. Bring the mixture to the boil, stirring constantly, and simmer it gently for 2 to 3 minutes. Stir in the butter and lemon juice and serve hot.



Cold desserts made with plums. The one at upper left is plum cream and that on the right is plum mould.

Bottling Plums

Plums, being a relatively soft easily broken fruit, are more attractive when bottled by the cold pack method. As they are an acid fruit little difficulty should be experienced in getting them to keep well whatever method of preserving is used. Some varieties, particularly greengages, may develop a brown tinge if they have been insufficiently sterilised. This browning, which is due to an enzyme action, can be avoided by longer cooking or by pre-cooking for a moment or two before bottling. A cloudy syrup is sometimes found in bottled greengages, but this does not mean they have gone bad.

Hot Pack Method

Sterilise the jars and lids in boiling water and keep them in the hot water until they are to be used.

Make a medium or light syrup, depending on the tartness of the plums (a light syrup has 1 part of sugar to 3 parts of water and a medium syrup has 1 part of sugar to 2 parts of water). Add the plums and cook gently until they are tender. Fill the sterilised jars until they are just overflowing with the boiling hot fruit and syrup. Make sure no particles of food adhere to the rim of the jar.

Screw down each jar tightly immediately it has been filled before starting the next one.

Cold Pack Method

Prepare the plums and pack them in hot jars. If plums are desired for show purposes, they may be pricked, which may help to prevent the skins from bursting. Freestone plums should be stoned before being packed and should be packed either cut side or peel side out. Cover with a hot light syrup to within ½in. of the tops of the jars, seal, and process the jars in a boiling water bath for 20 minutes.

If the fruit is being preserved for showing, the following method will give a better appearance. Pack the jars, cover the fruit with a cool syrup, and process the jars in a water bath. Starting with cold water, bring the temperature of the water bath to 180 degrees F. (a thermometer is necessary) in approximately 1½ hours and maintain it at that point for 15 minutes before removing the jars of fruit.

If an oven is used for preserving, the processing time is 50 minutes at 275 degrees F.

Deep Freezing Plums

The advent of the home freezer has led many owners to experiment with them in the freezing of many varieties of fruits and vegetables. Freestone varieties with firm flesh are the most satisfactory plums to use. The fruit should be ripe (preferably tree ripened) but firm and of high quality. Wash it in ice water or cold running water, halve and stone it, and peel it if desired. Pack in halves or quarters in either dry sugar or syrup. Plums packed in dry sugar may have a better flavour but slightly tougher skins than those packed in syrup.

Proportions of sugar to plums for dry packing are 1 to 3 for tart plums and 1 to 5 or 1 to 8 for sweet, mild-flavoured plums. A heavy syrup (1 part of sugar to 1 part of water) may be used for tart plums, and a medium syrup (1 part of sugar to 2 parts of water) for sweet ones. Unpeeled plums should be used within 5 or 6 months, as after this the skins develop an unpleasant flavour.

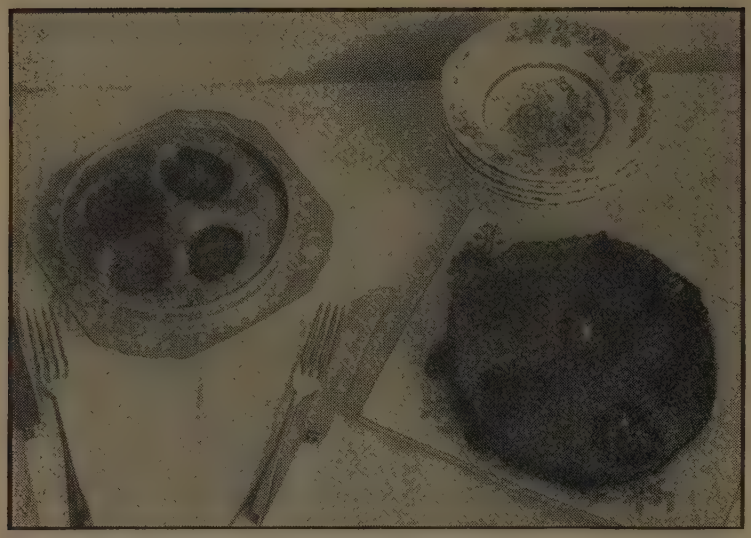
Frozen plums may be used in pies, fruit sponges, or fresh fruit salads.

Pickles and Sauces

Plum Chutney

2lb. of stoned plums
1lb. of apples
1lb. of onions
1lb. of raisins
1 pint of vinegar
1oz. of salt
6oz. of brown sugar
1 teaspoon of ground ginger
1 teaspoon of allspice
¼ teaspoon each of cayenne, ground cloves, mustard, and nutmeg

Chop the apples and onions, place all the ingredients in the saucepan or preserving pan, bring to the boil, and simmer until the mixture is of the desired consistency (approximately 1½ hours). Yields 4lb. to 4½lb. of chutney.



Hot desserts made with plums. That on the left is plum kuchen (the dish shown contains only half the quantities of the ingredients given in the recipe) and that on the right is plum upside-down cake.

Sweet Pickled Plums

6lb. of plums
3lb. of sugar
1oz. of ground ginger
½ teaspoon of ground mace
1 pint of vinegar
1 teaspoon of whole allspice
1 teaspoon of pepper corns

Choose firm-fleshed, dark plums, and prick the fruit with a needle thoroughly all over. Sprinkle half the sugar over it and stand it for 2 to 3 hours. Add the spices and the rest of the sugar to the vinegar, bring the mixture to the boil, and boil for 5 to 10 minutes. Cool it, add the plums, and simmer them gently for 8 minutes. Pack the fruit carefully into jars, reboil the syrup, pour it over the fruit, and seal the jars immediately.

Plum Sauce

6lb. of plums
2½lb. of sugar
2 tablespoons of ground ginger
3 pints of vinegar
1oz. of ground allspice
½oz. of ground cloves
2 tablespoons of salt

Boil all the ingredients together gently until they are soft and of the desired consistency (approximately 1 hour). Strain the sauce through a colander or sieve, bring it to the boil again, bottle immediately in sterilised bottles, and seal. It is desirable to use sterilised corks and to dip the tops of the corked bottles in wax to ensure an airtight seal.

Jam and Jellies

Plum Jam

6lb. of plums
½ to 1½ pints of water
6lb. of sugar

Wash the plums, stone them if they are freestone, and simmer them gently in the water until they are soft and pulpy. Use more water if the fruit is not quite ripe. Add the sugar, stir until it is dissolved, bring the mixture to the boil, and boil rapidly until the setting point is reached.

Stones may be removed as they rise to the surface. If the stones are removed before cooking, the flavour of the jam is improved if the kernels are extracted and cooked with the fruit. Yields approximately 10lb. of jam.

Plum and Marrow Jam

3lb. of plums
3lb. of peeled and chopped marrow
1 pint of water
Sugar

Use damson or other tart, strongly flavoured plums. Cook them in half the water until they are tender, then mash and sieve them. Cook the marrow in the remaining water until it is mushy and tender. Add the sieved plums and weigh the mixture. Add 1lb. of sugar for each pound of mixture, heat, stir until the sugar is dissolved, and then boil rapidly until a setting point is reached. Yields approximately 10lb. of jam for each 6lb. of sugar added.

Blackberry and Dark Plum Jam

5lb. of blackberries
7lb. of sugar
1 pint of water
2lb. of firm, dark plums such as Omega

Cook the plums in the water until they are soft and pulpy. Add the blackberries and boil gently for a further 15 minutes. Add the sugar and boil rapidly until the jam gives the setting test. Yields approximately 12lb. of jam.

Other mixtures which may be cooked in the same way are light plum and peach and plum and gooseberry.

Plum and Peach Jam

Use equal quantities of light plums and peaches in just sufficient water to prevent them from burning and add the sugar pound for pound with the fruit.

Plum and Gooseberry Jam

3lb. of plums
5lb. of sugar
2lb. of gooseberries
½ pint of water

Stew the fruits gently together, add the sugar, and cook as for plum jam.

Plum Jelly 1

Use firm tart plums such as damsons. Wash the plums and simmer them gently in a saucepan with a minimum quantity of water (½ pint to 6lb. of fruit) for 25 minutes. Mash them and strain them through a jelly bag. Measure the juice, add 1lb. of sugar for each pint of juice, and boil briskly until the setting point is given. Skim the jelly, pour into jars, and seal.

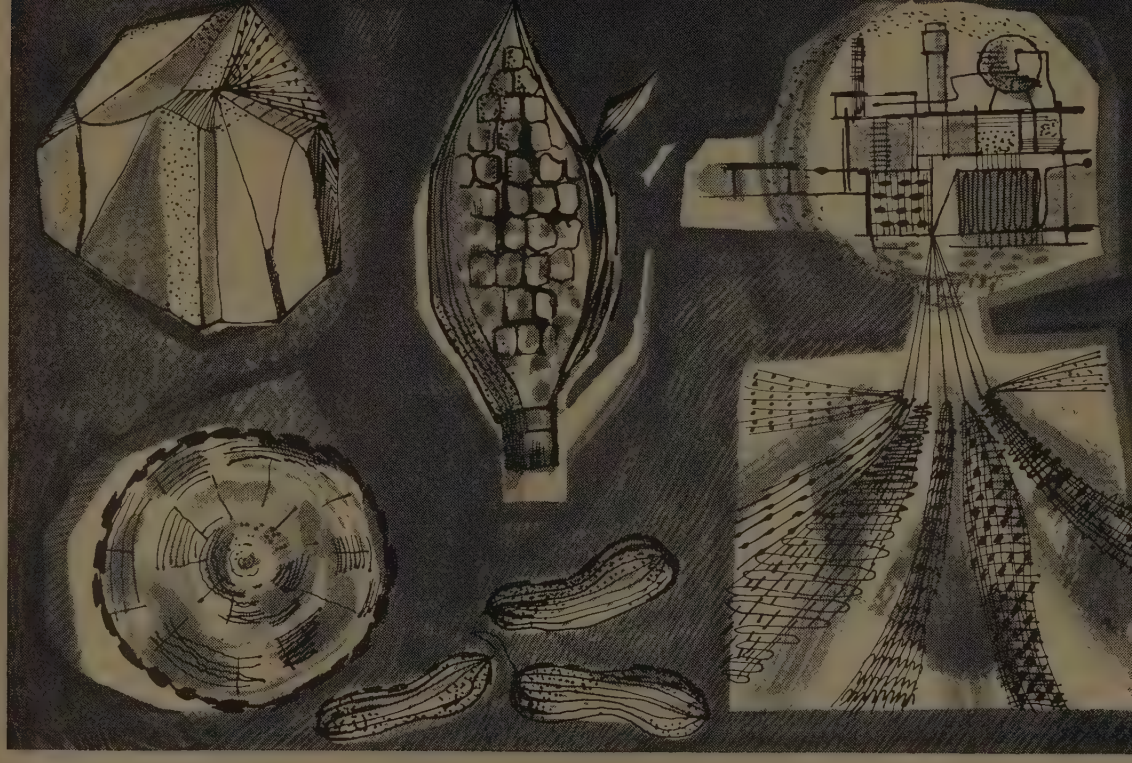
Plum Jelly 2

Use a commercial pectin extract. If tart red plums are used, this gives a clear, attractive red jelly with a delicate slightly acid flavour.

3lb. of red plums such as Doris
1 pint of water
3½lb. of sugar
2 tablespoons of pectin extract

Simmer the plums gently in the water until they are tender (25 minutes). Strain the juice through a jelly bag, add the sugar, stir until it is dissolved, and bring it to the boil. Add the pectin extract, boil the mixture hard for 1 minute, skim, and pour into jars and seal.

NEW FABRICS



By DAPHNE EILERS,

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DURING this century science has travelled far in the production of synthetic fibres. From such materials as wood chips, milk, peanuts, and coal, fibres have been produced by way of the test tube. In a world where population is ever increasing synthetic fibres assume great importance both alone and combined with natural fibres.

TWENTY years ago the consumer could buy a fabric knowing by its appearance and handle from which fibre it was made and what performance could be expected from it. Today there is such a bewildering array of new and strange fibres in a variety of textures and blends that a casual knowledge is not enough. The factors affecting the housewife's choice are not bound merely by the colour and texture and apparent suitability of the cloth. She wants to know the answers to such questions as "Will it wash or must it be dry cleaned?", "How does it react to ironing?", "Will it burn readily?". Sometimes it is difficult to get answers to these questions, as the actual fibre content is not always known. In some countries it is the practice to have a fibre content label and a label with cleaning instructions attached to material lengths and to ready-made goods. This makes the choosing of cloth for various purposes very much simpler for the buyer. However, until this becomes a general practice in this country the buyer must use her own knowledge to help her in her choice.

Types of Fibres

The four material fibres which have been the most important for cloth construction are wool, silk, cotton, and linen. Until the beginning of the 20th century natural fibres had no rivals, but in 1900 work was begun on the first man-made fibre, rayon. In the past 50 years vast improvements have been made to this fibre and today there are three types of rayon on the market, viscose, bemberg, and cellulose acetate.

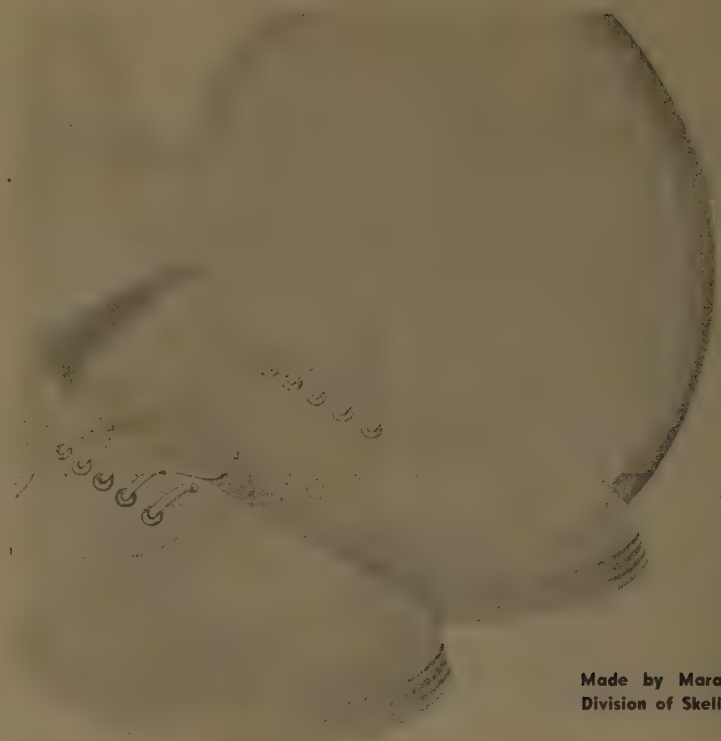
A second type of man-made fibre has been developed during recent years—the regenerated protein fibres. Of these the three important ones are the fibres from peanut protein, from the casein in milk, and from maize. None of these, however, is used alone. They are important because they blend easily with other fibres and though not strong enough for use alone, do not lessen the desirable properties of the fibres with which they are blended. In this way natural fibres are conserved by blending.

True Synthetic Fibres

The third type of man-made fibres are the true synthetics. Often people are heard to name any man-made fibre a synthetic. This is not so. Rayons and regenerated proteins are produced chemically from natural products (wood chips, cotton waste, and protein substances); their actual molecular structure is re-arranged. True synthetics are synthesised from such things as oil, coal, air, and water. Their molecular structure is built up chemically.

Of these synthetics nylon is probably the best known, though within the last few years many more have reached New Zealand markets either as ready-made goods or in the bolt. Terylene (American counterpart is dacron), perlon (French nylon), orlon, and dynel are all procurable. Saran is another synthetic whose main use is for car upholstery, as it is said to be practically indestructible.

These man-made fibres are produced as long threads known as continuous filaments. A number of these continuous filaments may then be twisted together to produce a multi-filament yarn or, if they are sufficiently thick, they may be used singly as monofilament yarn. Fabrics made from continuous filament yarn are usually



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sheer, light in weight, and have a crisp drape.

Alternatively, the filaments can be cut into lengths to produce "staple fibre". These lengths are determined by the use to which they are to be put. If the resultant fabric is to simulate a worsted material, the staple will be long; if the appearance of a woollen cloth is wanted, the staple will be short. In some cases the staples will be crimped in imitation of the natural crimp of wool. The staple fibre is then spun into yarn in the same way as wool is spun. It is from this particular process that such names as spun rayon, staple fibre orlon, and staple fibre dynel are derived.

The skill of the manufacturer in producing cloths from these man-made fibres is such that it is often difficult to tell from the handling or appearance from what fibre the fabric is made. There are, however, a number of simple tests by which the housewife can determine the fibres present. To make these tests it is necessary to obtain a small sample of the cloth, as obviously it would not be practicable or looked on with much enthusiasm by the retailer should the housewife start experimenting in the shop. Warp and weft threads drawn from the sample should be tested, also any yarn forming a contrast in pattern or design, as these may not be of the same fibre as the body of the cloth.

[*Malak*

The basic material for the manufacture of rayon is cellulose. This is obtained from certain species of pine and spruce and from cotton linters. The logs shown in the photograph would be transported to mills for conversion to wood pulp and the pulp would be sent to the rayon mills.

Identification Tests

Tensile Strength

To test the strength of the fibre a short length of yarn should be held firmly between the thumb and forefinger of each hand and given a sharp tug. This is repeated with a moistened yarn. If there is a considerable loss of strength when the yarn is wet it can be assumed that it is rayon. If there is no appreciable difference, the yarn is likely to be wool, silk, or one of the synthetics. Should the yarn show an increase of strength when wet, it will be cotton or linen.

Burning Test

For the burning test the yarn should be held to a flame and then removed. A lighted candle is most satisfactory for this. The smell of the burning yarn, the type of ash or residue, and whether the yarn burns both in and out of the flame will all help in identifying the fibre content.

Wool, silk, and protein fibres burn in the flame, giving off a strong smell of burning feathers. A black bead is formed which is readily crushed between the fingers.

Cotton, linen, and some rayons burn both in and out of the flame. They have a smell like burning paper and leave a wispy grey ash.

Acetate rayon burns in and out of the flame, giving off a smell of acetic acid and leaving a hard, shiny black bead. This bead is uncrushable when pressed between finger and thumb.

Nylon melts and shrinks away from the heat of the flame. A faint white smoke is discernible and a hard, light coloured bead is left.

Terylene has a reaction similar to that of nylon, but can be distinguished from it by the sooty smoke it gives off.

Orlon burns both in and out of the flame and leaves a hard black bead similar to that left by acetate rayon, but there is no accompanying smell of acetic acid, so that the two fibres could not be confused.

Testing of Blends

Trouble may be experienced where there is a blend of two or more fibres in the yarn. For example, with a blend of wool and nylon there will be a smell of burning feathers and a fairly hard black bead will be left. The mixture will not burn out of the flame. By burning alone it would not be possible to tell whether the second fibre was acetate rayon or nylon. However, by comparison of tensile strength wet and dry this fact would be established, since the yarn would be weaker when wet if it contained rayon. If nylon was present, there would be little or no difference in strength between the wet and dry yarn.

A wool-cotton blend after burning will leave a black ash with a small amount of white. If there is a greater amount of cotton than wool, the ash will be grey and will hold the shape of the original piece of yarn.

There is no simple way by which the housewife can determine the actual proportions of fibres in the blend.

Testing for Washability and Dry Cleaning

When the type of fibres present in the material is known attention should be given to the effect of washing or of dry cleaning fluids on the cloth. Where the material is made from only one type of fibre this may not be necessary, as the housewife will probably know from past experience. If the cloth has a mixture of fibres in it, however, it is advisable to test small pieces in soap and water and in dry cleaning fluid to note the reaction. Difficulty is sometimes experienced in ironing materials which have a warp of one fibre and another fibre as a filling thread. If one has a very much lower melting point than the other, puckering will occur should the iron be too warm for one fibre. If the prospective buyer discovers this from

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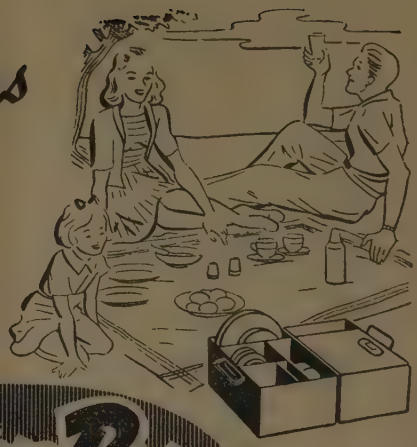

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the test made on the sample, she would be wise to avoid that material and choose one which will not raise the problem. If it is a crease-resistant fabric, of course, ironing will not be necessary, so the difference in melting point of the two fibres will not affect the buyer's choice.

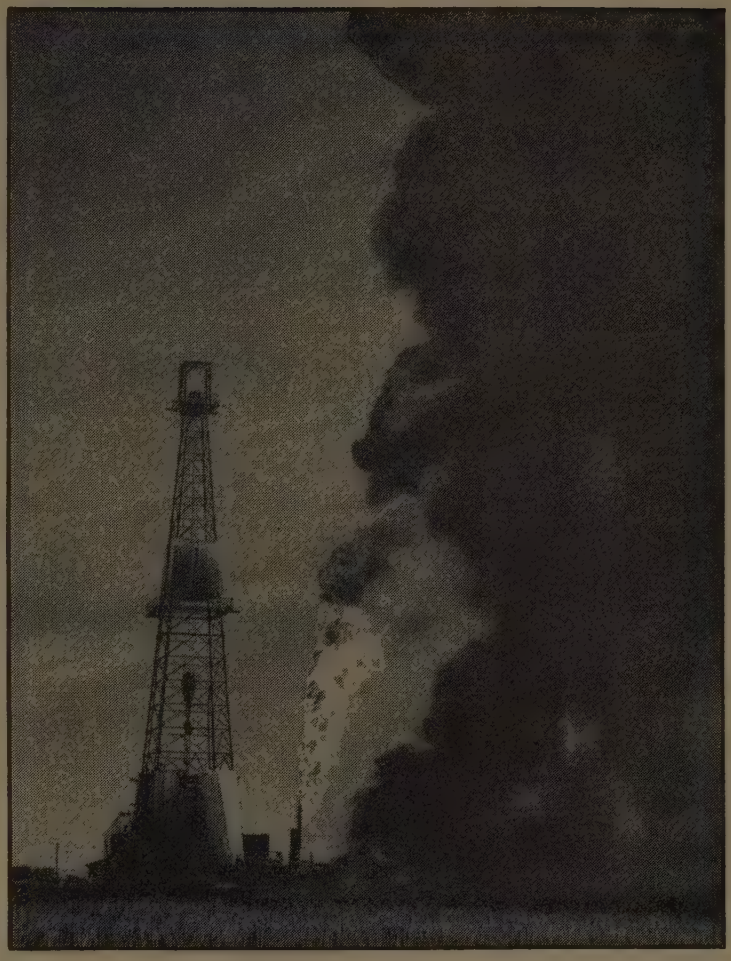
Properties of Textile Fibres

While no one fibre, natural or man-made, has every desirable property, each is suitable in its own field. Most people are well aware of the properties and uses of all the natural fibres. Through the years the public have come to know just what can be expected from rayon materials and what treatment best suits them, but the properties of the synthetics are not so widely known. Many people look on them as "wonder" fabrics and in many ways they are, but like other fibres they have some properties which are not desirable. It is well for the buyer to realise their limitations before purchasing them.

The synthetics have a very high tensile strength both wet and dry, so they are excellent for sheer fabrics, but materials made from the staple fibre form are inclined to form hard pills on the surface which are difficult to remove. Synthetics are resistant to rubbing and for this reason will wear longer. Stockings made from nylon will rarely wear out at heels and toes. The usual cause of loss is through pulls and snags on sharp edges. Terylene stockings are now on the market and there seems to be little difference between them and nylon ones except that they are a little harsher to the touch.

Crease resistance is an important property of the synthetics. It makes them particularly useful for travelling, as superficial creases caused by packing will quickly fall out when the garments are hung in the air for a short time.

They also have a very low moisture absorption, which is the reason for their rapid drying. Once again this is of great advantage to the traveller. Conversely, their low moisture absorption is one of their disadvantages. They do not absorb perspiration to any degree, so there is risk of chilling with sudden temperature change. This lack of absorption is more pronounced with garments made in a plain weave from continuous filament yarn and these may prove most uncomfortable to wear in hot, humid weather. Undergarments to be worn next to the skin cause less discomfort if they are of a mesh weave. Synthetic materials made from staple fibre yarn appear to have greater absorptive properties. Pleats in synthetics are not affected by washing or by rain, but again to offset this advantage of poor absorption there is the possibility of rain passing right through the fabric.



[*Imperial Oil*

Burning off contaminated oil after well drilling is completed. Oil is the basic material for the production of terylene (the American name is dacron).

Synthetic fabrics are "heat set" during manufacture to prevent shrinkage on washing. Pleats and creases are also "heat set" for permanence. If an iron of higher temperature than that of the "heat setting" process is used on the synthetic fabric, further shrinkage may take place. It is unlikely that this would be done other than accidentally, but it is a possibility. Great care should be taken to use only a warm iron. If difficulty is experienced in achieving a flat, pressed look when ironing filament nylon, it will be found that repeated light use of low heat and a damp cloth will give the best results.

White synthetic fabrics are likely to discolour, as the fibres will absorb small quantities of oil and grease from the skin. They also take up traces of dye shed by other garments if they are washed with coloured garments. For this reason synthetics should always be washed separately and as soon after use as possible.

One great advantage of the synthetics is their resistance to mildew and to insects. As they are chemical fibres, they contain no nutriments for moths or other pests. Storage of synthetic garments thus presents no hazards. All are resistant to chemicals with the exception of nylon, which is affected

Winding gear at the pithead of a coal mine. Nylon thread is produced from substances in coal combined with air and water.

by acids, and terylene, which is not as resistant to alkalis as are the other synthetics.

Fibre Blends

The main purpose of blending fibres is to achieve fabrics with the desirable properties of the fibres while minimising the undesirable properties. This blending of fibres may be achieved in two ways. For example, in a wool-nylon blend the nylon may be a long, continuous filament with the wool spun round this nylon core. Alternatively, the nylon may be cut into staples and blended thoroughly with the wool fibres. The mixture is then spun into yarn. The method used will depend on which property is to be emphasised. In a nylon-wool blend where emphasis is to be on durability a blend in the staple would give best results. If a crisp drape and quick drying were more important (as in a cotton-nylon frocking material), the filament core of nylon with cotton fibre spun round it would be suitable.

In blends of synthetic fibres with natural fibres the synthetics contribute strength, resistance to rubbing, and quick drying and help to reduce shrinkage. Blending of a synthetic and wool is useful in the production of permanent pleats in skirts and in permanent creases in trousers. The natural fibres contribute softness, warmth, moisture absorption, and in some cases cheapness. Rayon is important, too, in blends for its cheapness and moisture absorption. There are many wool and rayon mixtures on the market today. Usually they are labelled as "wool and fibro" materials.

Much work is being done on these blends, and tests for fabric strengths, abrasion resistance, crease resistance, and effects of dry cleaning and laundering, as well as many others are made to determine the effects of altering the proportions of different fibres in blends. It has been found that 75 per cent. dacron combined with rayon gave the resultant fabric resilience comparable to all wool, while only 25 per cent. dacron was needed in a dacron-rayon mixture to add crease-resisting properties to the rayon. Nylon was effective in increasing abrasion resistance and orlon improved the stability of wool, acetate rayon, and rayon fabrics to dry cleaning and laundering (J. B. Quig and R. W. Dennison, "Textile Research Journal" 24, No. 4, April 1954, p. 361).

The addition of synthetics to wool appears to reduce felting or shrinkage sometimes resulting from washing.

Interesting colour combinations can be effected with these blends. Where one fibre of the blend will "take" a certain dye, the other may not, so that a mottled effect can be achieved. Shot effects can now be given to rayon materials by having one set of threads of acetate rayon and the other of viscose. The material "in the grey" is run through a dye bath where the acetate is dyed the desired colour and the viscose is unaffected. When the material is placed in a second dye bath containing dye of another colour the viscose rayon is then tinted. A shot effect previously could be made only by dyeing the yarn before the loom was threaded up. The warp threads would be of one colour and the filling or weft threads of another.

Man-made fibres appear to have found their place in the textile world and instead of presenting a threat to the natural fibres they may prove even more useful in the future in augmenting the supply of natural fibres and reducing the cost of materials.

Care of Patent Leather Shoes

PATENT leather is produced by coatings of boiled linseed oil being poured on to a foundation of leather, the whole then being baked in stoves at a moderate heat.

Since this treatment alters the porous nature of the leather and deprives it of some of its elasticity, shoes of this material are less comfortable to wear than those of other leathers. A cheaper variety of patent leather is sometimes made from a foundation of canvas coated with a black preparation and then varnished.

Patent leather shoes should be cleaned in the following way:—

Dust them thoroughly and if necessary wipe them with a damp cloth, using mild soap.

Apply shoe polish with a small piece of soft cloth and rub the polish in thoroughly.

Polish them with a duster and finish off with a velvet pad, or

Use petroleum jelly or olive oil instead of shoe polish; these help to keep the leather soft and pliable.

Shoes should always be allowed to dry thoroughly at room temperature and be well aired after each wearing. Shoe trees should be used to keep them in shape. It is preferable for shoes to be kept in a shoe rack or on a shelf rather than in a closed cupboard.

These measures will prolong the life of any shoes.

—*MAUD B. STRAIN,*
Field Officer in Rural Sociology,
Department of Agriculture,
Dunedin

Hydrangeas in Gardens and Pots and Tubs

FEW other flowering shrubs can be used in as many different ways and under such different conditions as hydrangeas. They flower for a long period and do well in all but the coldest districts of the country. In this article K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch, discusses their culture in the garden and in pots and tubs in and round the home. The notes for routine work in the flower garden in February are by the same author.

HYDRANGEAS are natives of Oriental countries. They have been grown in China and Japan for centuries and have gradually been brought to Europe during the last 150 years. There are many species, but the common hydrangeas of New Zealand gardens are varieties of *Hydrangea macrophylla*, which are, however, also listed as *H. hortensia*, *H. hortensis*, and *H. opuloides*. In Continental catalogues and literature hydrangeas are often listed as hortensia, which is their common name in many countries.

During the last 50 years hydrangeas have been used extensively as pot plants in the countries of northern Europe and many new varieties have been bred.

In New Zealand hydrangeas are mainly used as shrubs, and as such they will tolerate very different growing conditions and still provide a reasonable display. Furthermore, they are remarkably free from pests and diseases. It has often been advocated that only the named varieties with deeper colours should be planted, but in coastal areas it will often be found that the old type with pale colours and vigorous growth will stand up to conditions much better. Under more sheltered and shaded conditions a better display can certainly be obtained with a good selection of varieties.

Some of the species are obtainable from New Zealand nurseries and are well worth considering.

Situation and Soil

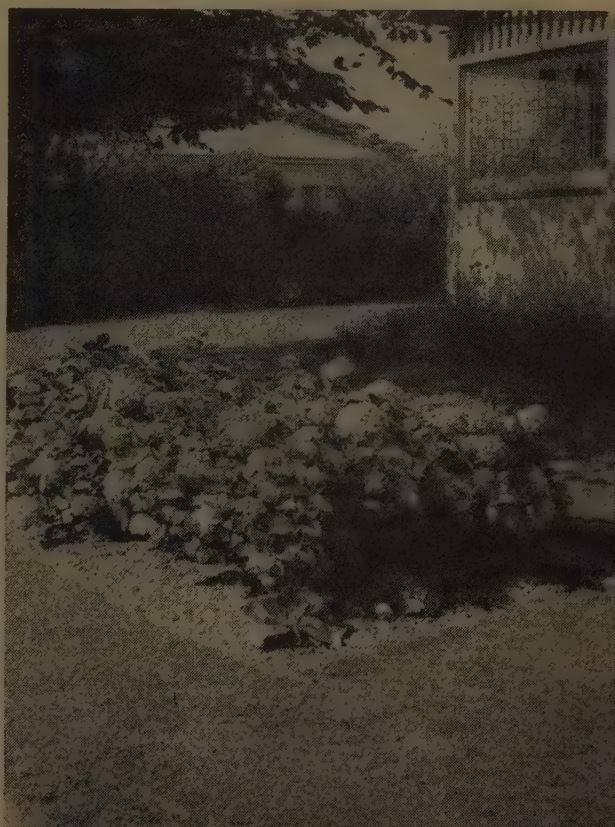
Perhaps the reason for the great popularity of hydrangeas is that they will grow and flower under most conditions. They will tolerate a very open position in full sun and flower well provided adequate water is applied. They will also grow in fairly deep shade and are useful for filling in corners where it is difficult to get anything to grow. Hydrangeas are often planted close to buildings, where they will develop quite satisfactorily. If they are sheltered by overhanging eaves, the natural rainfall is generally not adequate and they should be thoroughly watered periodically. An example of how hydrangeas have been used in this manner is shown in the upper illustration on this page.

The most suitable situation for growing hydrangeas is in semi-shade where soil moisture is abundant during summer but will not stagnate in winter.

A good medium soil containing plenty of humus, without being too rich, could be considered ideal. Heavy soils are also satisfactory, provided drainage is good, but hydrangeas are not happy if their roots are waterlogged in winter.

On very light soils organic matter in the form of old stack bottom, strawy manure, or half-rotted compost, should be incorporated before the shrubs are planted and mulches of the same type of material should be applied annually to keep the soil supplied with humus; otherwise

▲ Hydrangeas are useful for beautifying odd corners, even if the position is rather shady.
▼ Hydrangeas can also be used as bedding plants.



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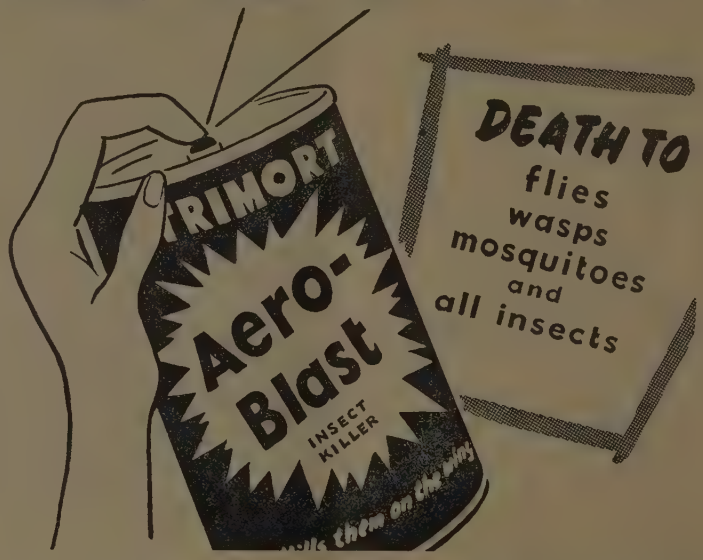

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the plants will readily show the effect of inadequate moisture.

Cultivation

Hydrangeas form a compact clump of very fibrous roots which have approximately the same spread as the top of the plant. To give the plant the correct treatment this must be considered.

Because the roots do not reach far in their search for nourishment, plant food and moisture should be available close to the plant. When a position is being prepared for planting sufficient organic matter should be dug in to improve both the water-holding capacity of the soil and the texture. A handful of blood and bone should also be applied and mixed in for each plant while the ground is being dug. A summer mulch, as described, is especially important round growing plants where the top is not large enough to shade the soil and provide cooler conditions for the roots. Such a mulch should be dug into the top 2in. or 3in. during autumn if that is possible, but it may be found that the roots are too close to the surface, when it should be dug in as close to the plant as practicable. If no summer mulch has been applied, a dressing of animal manure or compost should be dug in round the plants during winter.

If the organic material supplied to the plant is not considered to contain much plant food, a dressing of blood and bone, up to ½lb. for large bushes, should be applied in spring when the plants break into growth.

Watering will prove beneficial to hydrangeas in most districts during hot and dry periods because the root system is confined and compact. Sprinklers should be placed close to the bushes to ensure thorough penetration, or better still the hose should be left running near the centre of each plant. By the latter method the water will be supplied to the root directly under the plant where rain seldom falls.

Hydrangeas are fairly tolerant to frosts and will grow successfully in most districts, but it is not uncommon for early leaves to be damaged by a late frost. Such damage is generally soon covered up by new leaves and it has little effect on the plant. Plants recover remarkably well even from bad frost damage.

Under severe winter conditions the whole tops of a plant may die to ground level, but shoots from the base of the plant will generally break away in spring in the same manner as is shown in the top illustration on page 99, where the top of a plant died down after the plant had been transplanted in summer.

Effect of Soil on Colour

In some districts blue hydrangeas are mainly seen; in other districts pink ones predominate. The colour that will not develop in a district is often sought by local residents, and a brief outline of this colour change is therefore given with suggested treatment for the desired alteration.

Though the colour in some varieties is more persistent than in others, most hydrangeas are influenced by the amount of soluble aluminium in the soil. In acid soils aluminium is generally available and hydrangeas are blue; in alkaline soils the aluminium becomes fixed, and when this is not available to the plants the flowers will be pink.

Therefore the degree of acidity in the soil must be changed if a change of colour is desired.

If pink hydrangeas are desired and soil conditions are acid, lime should be mixed in liberally with the soil before planting and annual dressings of 4oz. of lime should be made whenever blue tints show in the flowers.

[*Elliott*

Left—Hydrangea "Parsival" has serrated-edged flowers which make it an outstanding variety. Right—The oak-leaved hydrangea (*Hydrangea quercifolia*) is a handsome deciduous shrub growing up to 8ft. high. It bears cream flowers in summer and its leaves make a good display in autumn.

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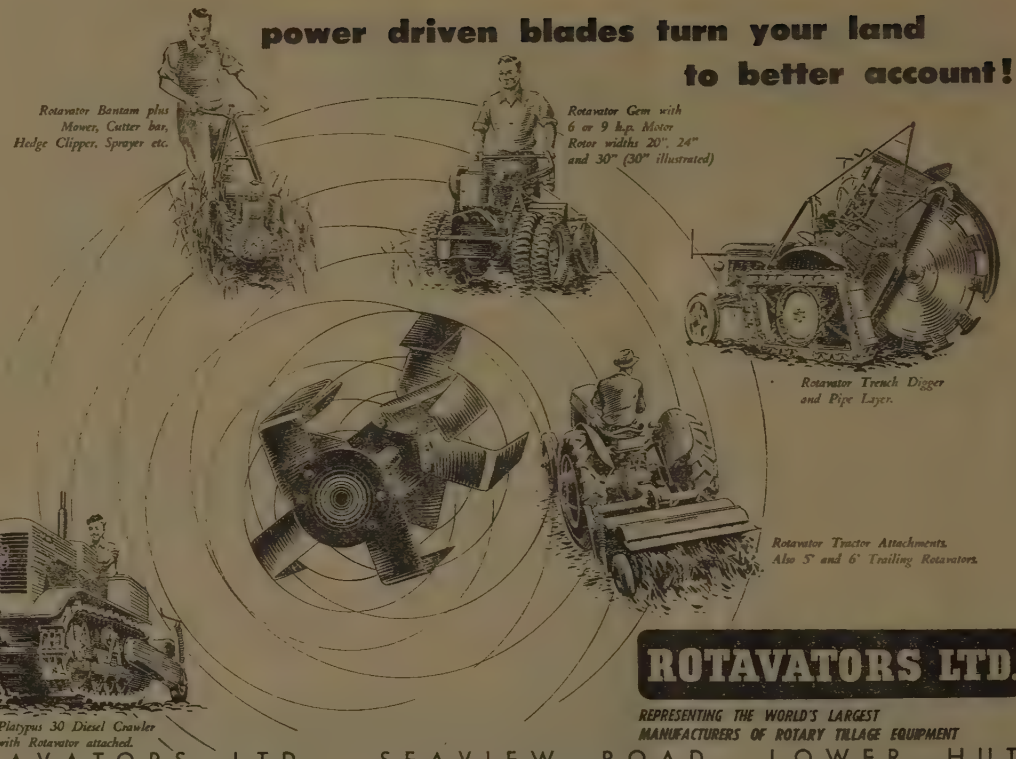

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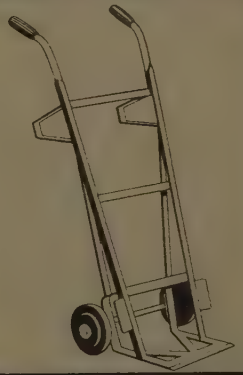

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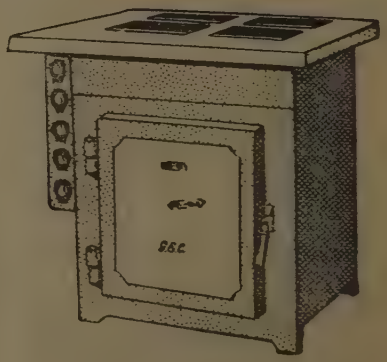

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To make the soil more acid, and thereby get blue hydrangeas, aluminium sulphate, sulphate of iron, or sulphur can be applied. Of these materials aluminium sulphate is the most desirable to use. Not only will it acidify the soil, but it will supply the actual material required to change the colour. If the other materials are used and the soil happens to be lacking in aluminium, the desired effect will not be obtained.

Aluminium sulphate is, however, toxic to plants if supplied in too great a concentration and it should not be used indiscriminately. It is best applied as a liquid at weekly intervals from spring onward at a concentration of 3oz. to 1 gallon of water. To large bushes a greater amount than 1 gallon can be applied.

Aluminium sulphate can also be applied as a topdressing round the bushes during winter while the plants are dormant. For very large bushes as much as 10lb. can be used, but after such an application care should be taken that the treated soil does not dry out or the plant may be damaged.

The colour of white flowered varieties is not subject to changes.

Pruning

To obtain large heads of flowers on shapely bushes hydrangeas should be pruned every year, but pruning should be adjusted to suit the climate in any district.

Where frosts are severe it is best to delay pruning till growth has begun in spring, as the additional top, including old flower heads, will give the plants some protection during winter. In spring all the branches which carried flowers the previous year should be cut back to one of the strong shoots that has developed on the branch and all weak growth should be removed. Those branches that have not yet flowered should be left unpruned, except where thinning out may be required. The extent of thinning out and the length to cut back are determined by the size and the shape of the bush.

Hydrangeas are attractive when grown as standards.

Most strong shoots can be expected to flower and if too many are left, the flower heads will be smaller and of poorer quality. An example of this method of pruning is shown in the illustration below.

In districts where damage from frost is not likely two methods of pruning can be considered.

The first method is carried out as soon as the flowers have faded. Weak shoots should be removed and branches which have flowered should be cut back. The extent to which pruning back should be done will depend on the vigour of the plant and on how many new shoots have developed from the base of the plant. Where plenty of new shoots have been produced it is best to prune the old branches off altogether, but where insufficient new shoots have developed to furnish the plant with flowers for the next year, the branches should be cut back only to where a side shoot has developed. If no side shoots have yet developed, only the old flowers should be cut off, with sufficient stem to maintain a good-shaped bush. The new shoots which have developed by late summer can be expected to flower the following season and thinning out of these, rather than cutting back, should be considered.

A recently pruned hydrangea, showing how the old flowering stems from last season have been removed and all new shoots are untouched.

The second method will apply in positions where the flowers do not dry off but remain decorative on the bushes for a long time and it is therefore not desirable to prune before winter. The same method of pruning as described above can then be carried out, but is considerably simplified because by this time the buds that are going to produce flowers the coming season can easily be distinguished from the leaf buds. The flower buds are the plump ones; one is always found at the tip of strong branches which have not flowered and others are seen along the branches, mainly on those that have flowered. These buds are often found in pairs. Pruning cuts should always be made just above a flower bud; the severity of the pruning will depend entirely on the size to which the bush is required to grow during the coming season.

Hydrangeas are tolerant of adverse conditions. The top of this plant died down after transplanting in summer, but new shoots came away from the base.

Use as Hedges

Hydrangeas form a very colourful hedge during the summer and where space will allow for their spread they should be considered for this purpose. They are perhaps especially useful for a dividing hedge within the garden, but they can be used on boundaries as well.

Hard-wood cuttings root readily (see section on propagation) and can be inserted where the hedge is to grow, or can be rooted elsewhere and planted out the following year.

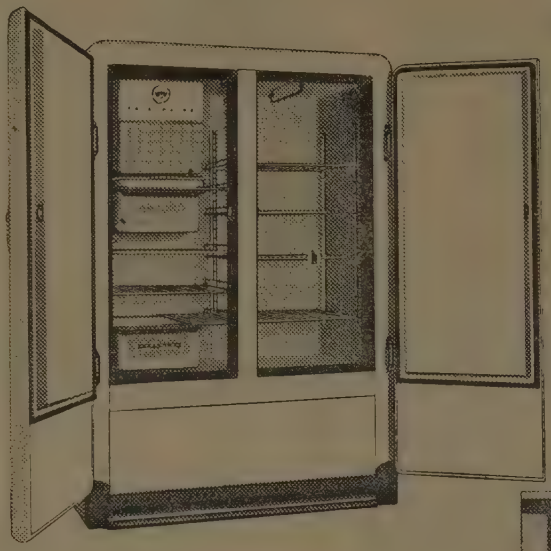
The distance between plants should be 3ft. to 4ft. according to the vigour of the variety used and the ground should be prepared in the same way as for specimen plants.

Pruning should be carried out in the manner usual for the district, and of course never with hedge clippers.

Hydrangeas as Bedding Plants

Hydrangeas can be used for a novel display in beds instead of the usual bedding plants.

First-year plants, with a single flower, can be used, but will not provide colour for very long, but if they are planted out while small, it is easier to keep them small by hard pruning. The lower illustration on page 95 shows a bed in which the plants have been growing for a number of years and they still provide good flowers.



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Planting should be fairly close, 12in. to 15in., and the plants should be grown fairly hardy. Pruning is best done during winter to flower buds situated low on the plants.

Hydrangeas can also be grown as standards, as shown in the illustration on page 99, by training a strong plant on a single stem until the desired height is reached. It should then be allowed to form a head and all shoots below should be suppressed. Long pieces of cuttings can be developed for this purpose.

Propagation

Hydrangeas are easy to grow from cuttings. The simplest method is by hard-wood cuttings which can be rooted in open ground. Cuttings should be taken in autumn, when the leaves are falling from the bushes; the best material is ripened wood that grew during the past season. The usual length is 6in. to 8in. The base of the cutting should be cut off just below a set of leaf marks and the top just above a set of buds. They should then be inserted to threequarters of their length in sandy soil in a frost-free place. Root formation will usually have begun by spring, when they can either be lined out for growing on or planted in their permanent position.

Soft-wood cuttings can be rooted during the growing season from the tips of shoots which have not yet flowered. A covered frame is required, as the soft tissues will easily dry out. The cuttings should be 4in. to 5in. long and trimmed off just below a set of leaves. The lower leaves should be cut off close to the stem and about half cut off the remaining leaves, as shown in the illustration on this page. A very sharp knife is essential for this job.

The cuttings should be inserted very firmly, about 1in. deep, either directly in the frame or in pots, as illustrated on page 102. The soil used for rooting should be of a sandy texture, or sharp sand alone can be used. After the cuttings are inserted a thorough watering should be given and the frame closed and shaded from direct sunlight. The cuttings should be damped down with a light watering on bright days and as soon as they show signs of growing the shading should be removed gradually and the frame opened for ventilation. When well rooted the cuttings should be lined out in a nursery row or potted up for growing on if wanted for pot plants.

Soft-wood cuttings can be taken in spring, when the plants begin to grow, or in January or February. Moderately strong shoots should be selected, but never those showing very lush growth.

Pot Culture

Hydrangeas are very popular as pot plants and not difficult to grow. The type of plant commonly seen in New Zealand homes carries one flower and is grown from a soft-wood cutting rooted the previous summer (see the illustration on page 102). After the cuttings have rooted they should be potted into 3in. pots in a good compost.

Cutting of hydrangea taken from the end of a non-flowered shoot. Note the method of preparation as described in text.

A suitable potting compost can be made up of:—

7 parts of loam
3 parts of peat, leafmould, or compost
2 parts of sharp sand

For each bushel (apple case) of this mixture should be added:—

4½oz. of dried blood
4½oz. of superphosphate
2½oz. of sulphate of potash
2½oz. of sulphur

When potted the plants should be kept in the frame for a few days and after gradually being hardened off they should be placed in a sunny position and kept adequately watered. When the roots have filled the pots the plants can be potted on into 5in. pots, provided it is not too late in the season for them to become established in the larger pots before winter, in which case they should not be potted up until they begin to grow in spring. The same soil mixture can be used.

During winter potted hydrangeas should be kept fairly dry, but after they have been dormant for a while they can be brought inside and grown on if early flowering is desired.

Liquid feeding should be done once the plants are well established in their pots and again when growth has begun in spring. Applications should be made at 2-weekly intervals, but if too lush growth develops, feeding should be discontinued for a few weeks. Animal manure in a weak dilution is satisfactory, or artificial fertiliser applied at ½oz. to a gallon of water of the following mixture:—

6 parts of sulphate of ammonia
2 parts of superphosphate
1 part of sulphate of potash

If flowers of a definite blue are wanted, applications of aluminium sulphate should be made as described earlier, and for pink flowers the sulphur in the potting compost should be replaced with lime.

Hydrangeas can also be grown with a number of flower heads. The cuttings should then be rooted in spring and potted up into 3in. pots as described above. When three sets of leaves have developed the top should be cut off, leaving two sets of leaves on the plant. Four buds will then break away usually and develop into small branches. The plants can be potted into 4in. or 6in. pots when required and must be grown in a fairly sunny position during summer to produce a squat plant.

If the cuttings have been taken very early, it may be possible to stop them twice, but this should not be attemp-

ted later than the middle of January; otherwise the new buds will not develop enough before winter to produce flowers next spring. Feeding and general treatment should be the same as described for the summer rooted cuttings.

Plants which have flowered in pots should not be kept for pot culture the next year. It is more satisfactory to plant them out and raise new plants from cuttings.

Hydrangeas in Tubs

Hydrangeas in tubs provide a colourful display for a long period. The tubs should be large enough to give adequate room for development of the roots; good soil should be used, preferably the mixture recommended for potting, and frequent liquid feeding carried out. Watering should never be neglected.

Only strong plants should be selected for planting out in tubs; those which have flowered in pots can definitely not be recommended. The best type of plant would be selected ones from nursery rows.

Pruning should be carried out as on specimen shrubs.

Treatment of Cut Flowers

Hydrangeas are very popular for use as cut flowers, but often they wither within a day or even a few hours after being cut.

The first consideration should be that the flowers are properly developed; otherwise they will seldom last. Preferably, they should be cut early in the day while the plants are still full of the moisture that has been taken up during the night. They should be placed in water immediately after cutting and while the stems are kept under water an inch or so should be cut off to prevent formation of an air lock. A teaspoon of alum for each quart of water in the container appears to make the flowers last longer and often creates interesting colour changes in the flowers.

Selection of Varieties

There are many good varieties of hydrangeas available and nurserymen generally give good descriptions in their catalogues. Among favourites are the following:—

Altona: Pink, blues well. Does best in shade.

Blue Prince: Rosy pink, blues well.

Carmen: Brilliant red or purple; dwarf.

Deutschland: Deep rose or purplish blue.

Goliath: Deep pink or purplish blue. Does well in coastal areas.

Hamburg: Deep pink or deep blue; lasts very well. Best in shade.

Heinrich Seidel: Deep red.

Holstein: Pink or deep blue. Free flowering.

Marechal Foch: Rich rose pink, blues well.

Parsival: Rich red, deep blue if treated (see illustration on page 97).

[Green and Hahn

Upper—Hydrangea cuttings potted up in sandy soil and ready to be plunged in a covered frame. Lower—Hydrangeas flowering in pots in early summer. These were grown from cuttings taken the previous January.

Flower Garden in February

Consideration should be given this month to the change of seasons and the ensuring of a winter display in districts where bedding plants will flower throughout the year. Sowing and planting should be done now and at least the earliest of spring flowering bulbs should be planted. In colder districts evergreen hedges should be trimmed for the last time this season. Rose enthusiasts who raise their own plants will be busy budding.

Above all, watering should not be neglected. During spring and early summer when plants are growing fast and show response to irrigation home gardeners generally use the hose frequently. During the hot period, even if growth is naturally slowed down, plants in the flower garden, including the lawns, require an equal supply of moisture. More thorough watering is required, as water which accumulated in the subsoil during winter may no longer be available as it was earlier in the season.

Bedding Plants

Bedding plants will flower during winter in many districts if they are set out early, but if they are not large enough when the weather turns colder, they will not generally flower before early spring.

Seed which can be put in now includes:—

Antirrhinum (preferably rust-resistant varieties), calendula, cineraria, nemesia, schizanthus, stocks, winter flowering marigolds, and winter flowering sweet peas.

Iceland poppies, *Primula malacoides*, pansies, and violas should be planted out before the end of February if flowering during winter is desired.

Anemones and ranunculus for early flowering should also be put in.

Bulbs

For the best possible display spring flowering bulbs should be planted

early. They will not flower earlier for that reason, but a better root system will develop which will result in better flowers as well as greater bulb increase. If a lengthy display of bulbous plants is wanted, a selection of varieties which will flower at different times during the season should be planted. Of narcissi varieties Soleil d'Or is one of the earliest and should never be kept long out of the ground.

If the ground has not been prepared beforehand, a position should be chosen where the soil is in good heart and a dressing of bonedust at 4oz. per square yard mixed into the soil before planting.

Provided drainage is good, bulbs can be planted fairly deeply, and if they are to be left in for a few years, that may be an advantage. The minimum depth for planting of average-sized bulbs is: Hyacinths 5in., narcissi and tulips 4in., iris 3in., and the smaller bulbs 2in. Smaller bulbs should be planted closer to the surface than larger ones and the lighter the soil is the deeper should the planting be.

Tulip species, especially the varieties of *T. fosteriana*, have become very popular. They are showy and well worth planting.

Gladiolus

Unlike most bulbous plants gladiolus should not be left in the ground until the leaves have died down. The foliage of gladiolus that flowered very early in the season will now have lost the fresh green colour and will be beginning to look dry. That is the time for lifting. In home gardens it is not usual to grow the cormlets on and if the plants are left too long, many cormlets will become detached. Some always remain in the soil and will be a nuisance when they grow the following year. Other reasons for early lifting are that the leaves may become infected with botrytis, the most common fungous disease of gladiolus, or infested with thrips, the worst insect pest of this plant.

Where the plants are known to be badly infected with diseases or pests it is better to cut the foliage off close to the ground before lifting, remove the tops carefully, and burn them; otherwise the foliage can be left on when the plants are being lifted and cut back when they are dry. The drying should be done in a warm position, but extremely dry conditions may harm the corms. When sufficiently dry the old corms should be removed and the tops either cut off close to the corm or pulled off. Before the bulbs are stored for winter it is wise to dust them with 5 per cent. DDT, which will kill thrips present on the corms.

Chrysanthemums

Flower buds are developing on chrysanthemums and if specimen flowers are required, disbudding should be carried out continuously. Tying in should be done whenever required and liquid feeding continued until the buds show colour.

Rust is difficult to control on chrysanthemums. One of the most important factors in prevention of this disease is to make sure that the plants do not receive a check in growth, for example through lack of water. Fortnightly spraying should be continued with lime sulphur at 3½ fl. oz. plus colloidal sulphur at ½oz. to 4 gallons of water.

Evergreen hedges in southern districts should be given their last trimming of the season during February so that when winter sets in they will be clothed in new shoots.

Lawns

New lawns are best established during autumn. The soil is then warm, the grass seed will germinate readily, and the new turf will become established quickly. For the laying down of a satisfactory lawn during late March or April the site should be prepared now to enable natural consolidation of the soil.

After the area has been dug over and all perennial weeds are removed it should be made moderately level. Hoeing should be done periodically to kill any weeds that have grown. After each hoeing levelling should be done. When it is time for sowing down, the area will be ready, and the job is more likely to be done at the correct time.

If weed control is desired in established lawns by hormone weedkillers, late February is the best time for application. The hormones require high temperatures for full efficiency and if they are applied now, susceptible weeds will have died before time for renovating and resowing. Grass seedlings can then be established where large weeds have been; if that is not done, new weeds will soon grow and the killing of the old ones will have been in vain.

Hormone weedkillers should be applied according to the manufacturers' directions and the spray pump should be very thoroughly cleaned after use to make sure that no traces of the material remain when the pump is next used.

Care should also be taken to avoid spray or drift of the hormone lodging on nearby hedges or plants.

Hedges

It is never advisable to trim an evergreen hedge during winter when growth is at a minimum. Trimming should be done early enough to enable growth of a slight cover of new shoots during autumn. In southern districts the job should be done during February. The hedge will then look much more attractive in winter. Furthermore, if slightly frost-tender hedge plants are trimmed late in the season, frost may kill them, but where a good cover of shoots has been established they may become damaged, but generally only at the tips, and new buds will break away when the weather becomes warmer.

Ordering Trees and Shrubs

It is most disheartening not to be able to obtain certain plants when an order is placed with a nurseryman or shop. That often happens during winter, especially if the plant, or a particular variety, is a popular one. To avoid such disappointment planning for winter planting should be done early and the order booked. The cost of the plants will be the same, but besides the gardener being more sure of obtaining the desired plants it is often found that early ordered plants are of better quality than those bought later during the planting season. When an order is placed the desired size of the plant should also be stated.

SALAD SUGGESTIONS FOR SUMMER

1. Crisp lettuce salads are the thing to tempt appetites flagging in the summer heat. For best results the lettuce must be very crisp. This presents no problems for those with refrigerators, for if the leaves are washed, shaken free of excess moisture, and placed in a covered dish on the lower shelf of the refrigerator, they will emerge crackling crisp.

2. Those without a refrigerator will find that the washed leaves will become crisp if they are hung in a wire basket in a cool, draughty place. If no wire basket is available, a tea towel serves just as well.

3. When the lettuce has attained crispness it should be preserved by as little handling and cutting as possible and lettuce should never be sprinkled with salt before serving. If whole-leaf salads do not meet with the approval of the family, the leaves can be torn into more manageable pieces and still remain crisp and unbruised.

4. In addition to having crispness of texture, the successful salad must be quite cold. It must not be soggy with moisture. Each leaf should be shaken well to remove the water and then drained.

5. Green salads can be an exciting accompaniment to a meal. A mixture of any of the salad greens is suitable. Lettuce usually predominates and stronger-flavoured leaves should be kept down to a minimum. Any of the following in varying combinations will give a refreshing salad: Heart cabbage (sliced finely), parsley, chopped chives, mint leaves, sliced unpeeled cucumber, shredded silver beet, chopped celery, young green peas, and, to give a sharp tang, one or two nasturtium leaves cut finely.

For those who grow herbs there are unlimited flavour combinations. This type of salad is best tossed with oil and vinegar just before serving or served with an oil and vinegar dressing.

6. **Oil and Vinegar Dressing (Vinaigrette Sauce)**

2 small saltspoons of salt
1 saltspoon of pepper
2 saltspoons of prepared mustard
2 tablespoons of white vinegar (wine vinegar is best)
4 tablespoons of salad oil (olive or soya bean)

Mix all the ingredients together and pour them into a bottle, shaking them thoroughly before use. This quantity is sufficient for four servings. It is not a good practice to make up more dressing than will be used at one meal.

7. Those who like the faintest flavour of garlic with their salads can achieve it by making garlic vinegar to use in their dressing or mayonnaise.

By DAPHNE EILERS,
Field Officer in Rural Sociology, Department of Agriculture, Auckland

A clove of garlic is peeled, pricked, and dropped into the vinegar bottle, left for 2 or 3 days, and then removed. A subtle tang of garlic is left. Another method is to rub the salad bowl with a clove of garlic.

8. For a special occasion the ingredients of the salad may be served separately so that each guest makes his own serving to his taste. The ideal for this is a tray with dishes to fit it exactly, but a large meat plate is equally practical. The dishes or sections of the plate can be then filled with grated carrot, cut tomato, quarters of hard boiled egg, green peas, grated beetroot, spring onions, sliced green peppers, chopped apple and celery mixed with salad dressing, grated cheese or cottage cheese, and so on in endless variety.

9. Potato salad is a favourite Continental salad and is delicious with lettuce or served with hot savoury meats. Cold boiled potatoes are cut into regular cubes and mixed with finely chopped parsley, chives, and celery. Pepper and salt to taste are added and the whole covered with an oil and vinegar dressing or with salad dressing and allowed to stand at least half an hour before serving. Finely chopped onion or shallot may be used in place of the chives if desired. The potatoes used in the salad must be of a firm, waxy variety so that the pieces hold their shape during the mixing.

10. A mixture of sweet and savoury flavours makes an interesting salad and so widens the choice of ingredients. The following are some mixtures which may be served in lettuce cups. Most of them are improved by soaking in dressing for half an hour before serving.

Chopped apple, celery, and walnuts.

Apple wedges, grapefruit sections, and nuts.

Pineapple cubes, cheese cubes, and lemon juice.

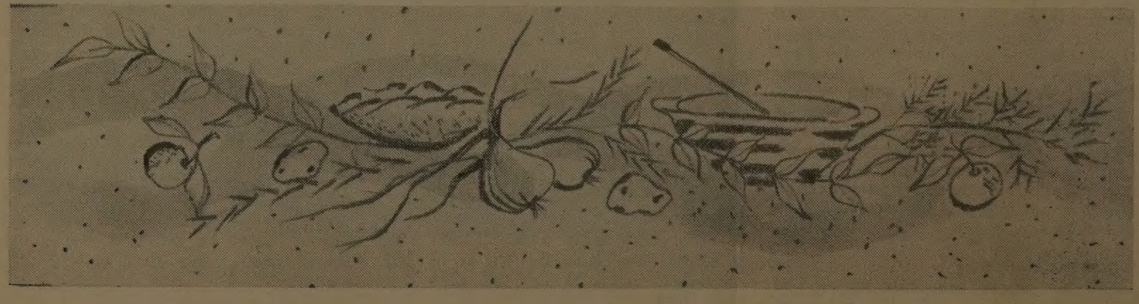
Shrimp, banana slices, and lemon juice.

Peach halves with cream cheese and walnuts.

Cucumber, crayfish, and grapefruit sections.

11. When time permits mixtures such as those mentioned above can be set in aspic jelly, either in individual moulds or in one large mould. A lime- or lemon-flavoured jelly may be used as a variation.

12. The last salad suggestion is the coleslaw. This is a cabbage salad. Fresh young cabbage is washed, dried carefully, shredded finely, dusted with salt and pepper, and left for ½ to 1 hour in a marinade of oil and vinegar or thin salad dressing. Some red cabbage may be also mixed in to give colour, and crisp textured, sliced, green or red peppers, diced apple, or celery may be added according to taste.



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